

# **The Role of the Farmers' Associations in the Rehabilitation of the Gum Arabic Belt**

**A Case Study: North Kordofan State**

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# DEDICATION

To the soul of my beloved parents, and the soul of my beloved brother Imam,  
to my husband Osama El Gaali,  
To my dear brothers and sisters  
*With great appreciation*

## **Acknowledgments**

A lot of thanks and praise are due to almighty Allah, who created me from nothing, providing me with health and power to study and accomplish this research. I am really impotent to sign thanks and appreciation to my supervisor Dr. El Amin Sanjak for his invaluable help, endless patience in data analysis, sincere support and encouragement through his guidance of this work. I am also very grateful to Dr. M. Mukhtar for his real interest on this study, clear guidance to begin the work, with his valuable suggestions, in putting out the broad lines of the study. I would like to express my thanks to Dr. Abdel Azim Mirgani FNC general director for giving me this chance and sponsoring the study. Distinctive thanks are extended to our colleagues in FNC office of North Kordofan State, Amani and her staff, Osama Taj El Sir, for the proper data collection; thanks also should be extended to my colleagues in FNC H.Q. Great thanks and special appreciations should go to my colleagues, all brothers and sisters in planning section especially, Sayda M. El Hassan and Sayda Khalil, Adil, Kawthar, and Hanady Ibrahim., for their friendly assistance during the whole period of the study. I deeply appreciated and thankful to my husband Osama El Gaali,, and my sisters and brothers for their helps .

## **Abstract**

### **The Role of Farmer's Associations in the Rehabilitation of the Gum Arabic Belt A Case Study: North Kordofan State**

In Sudan the gum belt extends from east to west between 10°-14° N. Until fairly recently, Kordofan has been more widely known for the production of gum arabic from the tree of *A. senegal*. The apparently well-balanced traditional system began to decline due to variety of factors, some projects exerted considerable efforts to rehabilitate the gumbelt in the state, but the price of gum arabic is declining compared with other cash crops that led farmers to ignore tapping their hashab trees, or cut them for charcoal. The broad objective of this research is to investigate the possibility of rehabilitating the gumbelt zone through the establishment of Gum Arabic Farmer's Associations and guarantee raising of standard of living of the local communities. Two types of data were collected to provide the necessary information, namely; primary and secondary data. The primary data were collected through questionnaires, interviews and observations. The main findings of the research are; through the establishment of farmer's associations, the project of rehabilitation of gumbelt was able to sustain the activity of gum belt. The associations act as a rural bank. Using the project's revolving fund allocation as a grant, it was envisaged that the "Sanduk" will evolve as a permanent and sustainable credit institutions. After the establishment of the associations there is a tremendous increase of areas and stocking density of hashab trees. There are two types of markets of gum before the establishment of the associations namely; village markets and urban markets. After the establishment of the associations the village committee is the responsible body for marketing and facilitation of credits. The benefits of the associations as perceived by the farmers are; provision of credit accessibility, abolishment of the role of peddlers, brokers and the "sheil" system, and provision of extension services beside other benefits.

The main conclusions of the research are: adoption of the farmer's associations increased the stocking density of the hashab trees in the study area and controlled the market mechanisms of gum Arabic. The main recommendations of the research are; the importance of constructing special extension messages to recruit the youth in the field of gum tapping and picking. The FNC should find channels for financing the farmers through credit accessibility.

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# CHAPTER I

## INTRODUCTION

### 1.1. Background

Sudan exhibits a series of variation in soils, climatic conditions and hence ecological zones ranging from hot dry desert in the north to the moist tropical climate in the South. *Acacia senegal* L (Willd.) is the most important tree species in Sudan with a wide range of uses, it produces gum arabic, stabilizes soils, used as a fodder for grazing animals, fertilizes soils by fixing atmospheric nitrogen, and used as fire wood. Gum arabic is the natural gummy exudate obtained by tapping the branches of *A. senegal* tree and its closely related species. *A. senegal* occurs in the savanna belt of Africa and extends over a wide range of ecological zones that differ in altitude, rainfall and soil type. In Sudan the gum belt extends from east to west between 10° N- 14° N (Abdel Nour & Abdel Majid, 1997). But recently from my own observations the belt was moving southwards covering vast areas in Upper Nile and South Kordofan States.

As early as 2000 B.C. gum arabic was reported to have been used by the Egyptians for making paint colours (Blunt, 1926). In modern times gum arabic has been used extensively in the food, pharmaceutical, cosmetic, and other industries e.g. printing, painting, and ink. The importance of gum arabic lies in its multiple uses. It is used in different items, such as foodstuff, pharmaceutical, textile, ink, paper and other manufactures.

The Project of Restocking of Gum Belt for Desertification Control has completed its three phases (1980-1995), with UNSO assistance made possible by a grant from the Government of the Netherlands, and was formulated to initiate the

reversal of environmental degradation in the gum belt of Kordofan region and to reintroduce economic activities suited to the ecology of the area (UNSO, 1989).

## **1.2. Scope of the Study**

The starting premise of this research is to tackle the issue of forest local organizations or institutions and their role in managing forest resources and enhancing the social wellbeing of the communities. The definitions used in article “Forests, Trees and People Newsletter No. 22” by Uphoff (1983): “An institution is a complex of norms and behaviors that persists over time by serving some socially valued purpose. An organization is a structure of recognized and accepted roles”. The norms (shared principles) include rules about what can be taken from the forest and when. The behaviors include collection practice and, in the pasts, the practice of rotating responsibility for guarding the forest. There are many well documented examples of indigenous resource management systems. Among the best known are farmer-managed irrigation system, documented for many countries. There are also examples of complex management systems involving fisheries, pastures, and forests (Uphoff, 1983).

The local institutions illustrate the capacity and creativity of people to create institutions that effectively serve their needs. They are all positive examples of what can happen when people have, or are supported to take, control of their own lives in order to solve the problems they are facing. But it also raises, and leaves un answered, many questions concerning the possibilities to work with and through local institutions as a more effective strategy for achieving sustainable natural resource management. The relevance of such a strategy is obvious as these local institutions embody the local knowledge that has evolved in culturally and ecologically specific situations. They are the creations of the people themselves who, because they are dependant on their natural resources for their survival, are most interested in maintaining them. But they do not provide a simple clear cut solution. The changes occurring in the world put heavy demands on these

institutions and not all have been, or are able, to adopt. Nor are all suitable for reaching the goals of equity that may consider to be so important.

In this research special emphasis was given to the local institution (farmer's associations) in the field of gum production. North Kordofan State is selected as a case-study where as considered as representative of the gum belt.

### **1.3 Problem Statement**

North Kordofan has traditionally been regarded in the Sudan as a major source of primary agricultural production, the region being self-sufficient in items as sorghum, millet, milk, and edible oils, also it was able to export surplus to the more densely populated areas. Furthermore, Kordofan contributed substantially to national foreign exchange earnings through the export of each crops, particularly sesame, hibiscus, groundnuts, melon seed, livestock and hides.

Until fairly recently, Kordofan has been more widely known for the production of gum arabic from the tree of *A. senegal*. Until 1960 Sudan exported 85% of global demand of gum arabic, 50% out of this were from Kordofan. The diversified agricultural production of Kordofan was made possible through the development of a traditional agroforestry, tree-fallow/cropping rotation system, practiced by farmers for generations. The hashab tree was the key to this traditional system and in maintaining ecological balance, provide browse for livestock, fuelwood, poles and as source of revenue. Since 1960 onwards, the apparently well-balanced traditional system began to decline due to variety of factors, mainly the drought of 1973 - 1984 -1985. some projects exerted considerable efforts to rehabilitate the gumbelt in the state, but the price of gum arabic is declining compared with other cash crops that led farmers not to tap their hashab trees, but cut them for charcoal. Also there is no organized body to organize the farmer's activities or encourage them to participate in developing the gum gardens and guarantee reasonable prices through selection of reasonable marketing channels. Therefore, this study

attempted to explore the experience of local institutions (Farmers' Associations ) and their potentiality in developing gum arabic enterprise

#### **1.4 Objective of the Research**

The broad objective of this research is to investigate the contribution of Farmer's Associations in rehabilitating the gumbelt zone and guarantee raising of standard of living of the local communities, more specifically;

1. To investigate the relevance of the created farmers associations with respect to potentiality and capability to contribute positively to the rehabilitation of the gumbelt.
2. To assess the farm-gate returns to rural communities after the formation of farmers association which provide technical know-how of tree-planting and tapping; value-adding by cleaning, grading and packaging, and collective delivery and marketing.
3. To explore the role of credit accessibility in mitigating the negative consequences of the traditional credit systems (Shiel, intermediates and smugglers).
4. To determine the measure of risks and constraints confronting the adoption of innovation.

#### **1.5. Research Assumption**

1. Hashab gardens play an important role in the stability of environment besides its role in the economy of farmers and communities development.
2. Farmer's associations create strong link between producers and end users.
3. Through farmer's associations the involvement of the local inhabitants in managing their natural resources, after the right delivery of the technical knowledge which is in harmony with their indigenous knowledge, the problem solution can be enhanced.

### **1.6. Research Justifications**

Forestry resources in the study area are vital to the Sudanese economy, first, they provide a source of energy in the form of fuel and charcoal, and secondly, they provide poles and timber for building. Thirdly, they constitute a source of valuable foreign exchange from gum arabic. Fourthly, they contribute to a greater resilience in traditional small holder agricultural systems through improved soil and water conservation and increased income from the sales of forests products. Finally, they provide one of Sudan's most effective means for preventing desertification. All the above will be more efficient by establishing a well organized body to undertake responsibilities of introducing farmers' services and the proper resources management in sustainable manner, and representing the farmers nationally and internationally.



## **CHAPTER II**

### **THE STUDY AREA**

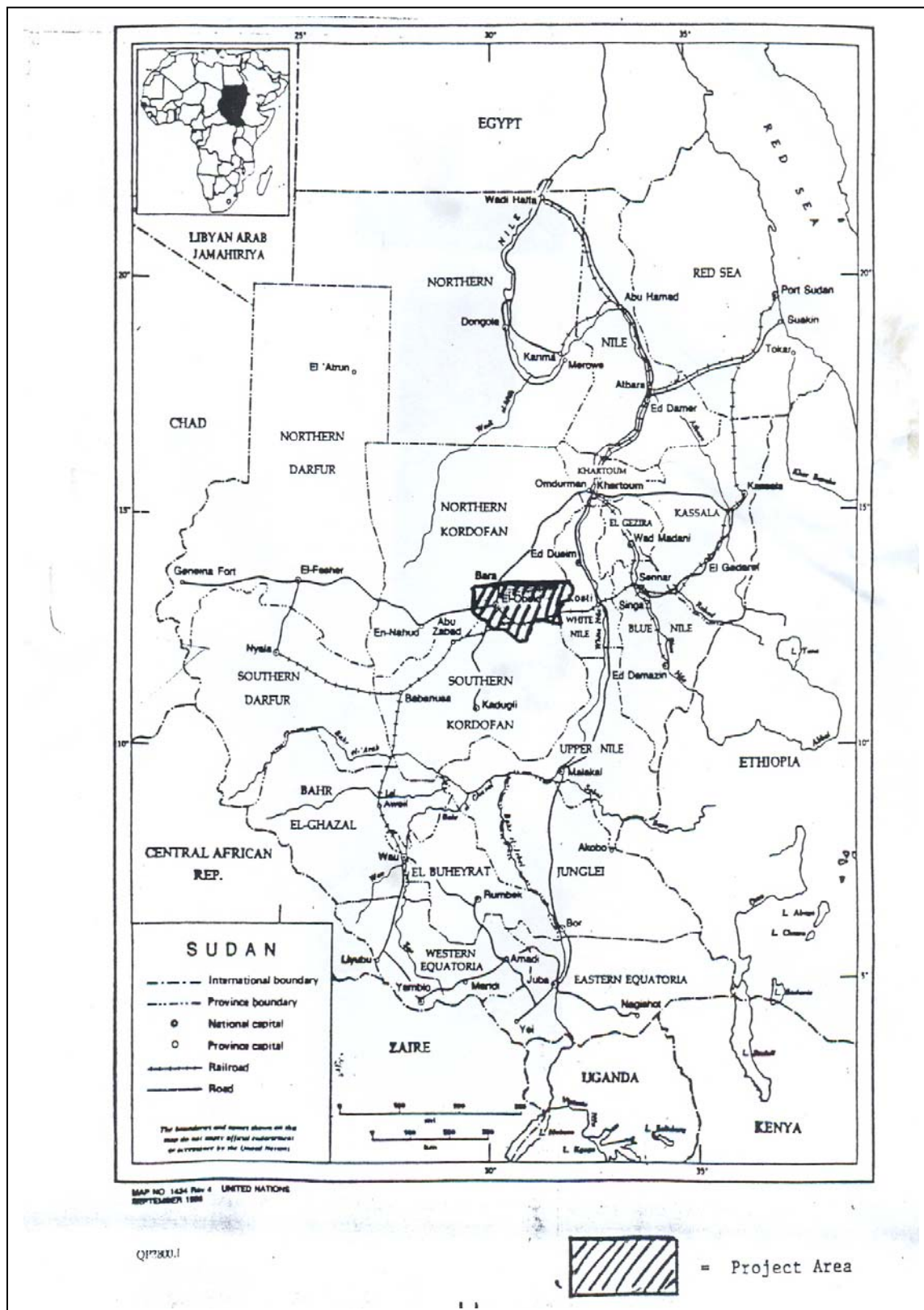
#### **2.1. Location**

The study area covers North Kordofan State which is considered as representative of the gum belt in Western Sudan, and is located between latitudes 12°-16° N. and longitudes 27° - 32° E. The area of the gum belt in the state is roughly 43.900.000 feddans (El sammani, M. O. 1985a). Therefore, most of Northern Kordofan State lies within the Gumbelt broad strip of sandy soil with 250-400mm isoheights, which stretches from Darfur to Kordofan and which is primarily forested with different species of *Acacia*'s trees. *A. senegal* ( hashab), the principal producer of Gum Arabic, find ideal conditions in the Goz (sandy) soils of the state along these isoheights. Hashab requires about 200 mm, more annual rainfall on clay soil than on Goz and the southern clay areas of the state are too dry for *Acacia senegal* trees to grow. The density of trees and grasses increases towards the south, reflecting the higher rainfall in this part of the state. The predominance of *A..senegal* has evolved over generations through the systematic suppression of other trees and shrubs by the farmers (SCF, 1988).

#### **2.2. Administrative Structure**

Adminstratively, North Kordofan State consists of five localities, namely; Sheikan, Um Rawaba, Bara, Sawdary and Gabrat EL Sheikh. Each locality is further divided into smaller adminstrative units, and the total number of the adminstrative units is twenty-one (Table 2.1). This research covered two localities, Um Ruwaba and Sheikan localities (Table (2.2)). These localites witnessed the establishment of the Farmer's Association since 1992, during phase three of the gum belt project (1990-1995). The idea of Farmers's association is expected to cover the other localities with the expansion of this pioneer model.

Fig (2.1) Map of the Study Area



**Table (2.1): The administrative structure of the study area**

<b>Locality</b>	<b>Administrative Unit</b>
<b>Sheikan</b>	<ul style="list-style-type: none"> <li>- El obeid Town</li> <li>- El obeid rural council</li> <li>- Kazigel</li> <li>- Abu Haraz</li> </ul>
<b>Um Rawaba</b>	<ul style="list-style-type: none"> <li>- Er Rahad Town</li> <li>- Er Rahad rural council</li> <li>- North Um Ruwaba</li> <li>- Um Ruwaba Central rural council</li> <li>- Wad Ashana</li> </ul>
<b>Bara</b>	<ul style="list-style-type: none"> <li>- Bara Town</li> <li>- Bara Rural council</li> <li>- Tayba</li> <li>- Um Kredim</li> <li>- Mazroub</li> <li>- Um Garfa</li> <li>- Um Sayala</li> </ul>
<b>Swdary</b>	<ul style="list-style-type: none"> <li>- Swdary</li> <li>- Hamrat Ek Sheikh</li> <li>- Um Badir</li> </ul>
<b>Gabrat El Sheikh</b>	<ul style="list-style-type: none"> <li>- Hamrat El wiz</li> <li>- Kajmar</li> </ul>

Source: North Kordofn State, Wali Office 2003

**Table (2.2): The selected administrative units in the research area**

<b>Locality</b>	<b>Administrative Unit</b>	<b>No. of village</b>
<b>Sheikan</b>	- El obeid rural council	2
<b>Um Rawaba</b>	<ul style="list-style-type: none"> <li>- Er Rahad rural council</li> <li>- Um Ruwaba central rural council</li> </ul>	4 (two have no associations) 2
<b>Bara</b>	- Um Kredim	2 (area of no associations)
<b>Total</b>		10

Source: North Kordofn State, Wali office 2003

### 2.3. Climate

The climate of the study area is tropical with a short rainy season. The rainy season starts in June and reaches its peak, with an increase in the number of rainy days, in July and August. Table (2.3.) shows rainfall during the period 1990-2002

in North Kordofan State. The rainy season is followed by a transitional period known as *darat* (harvest season) which is marked by a sharp drop in humidity and a decline in night temperatures. The *darat* is followed by winter which is the cold dry season (lasts from mid November to February) when the hot dry season summer starts. Air humidity is lowest and temperatures are highest in March and April (El sammani, 1985b ).

**Table (2.3 ): Rainfall (mm) in the study area**

Season	Total rainfall (mm)
1990 – 1991	164.7
1991 – 1992	233.5
1992 – 1993	287.3
1993 – 1994	278.5
1994 -1995	357
1995 – 1996	405
1996 – 1997	332.5
1997 – 1998	382.5
1998 – 1999	422.5
1999 – 2000	464
2000 – 2001	226.5
2001 - 2002	306

Temperatures over the gumbelt plain area steadily increase in southern direction. The yearly normal minimum temperature is 20 c°, while the annual normal maximum temperature is 30 c° (El sammani, M. O. 1985b).

#### **2.4. Vegetation Cover**

The forest types in the study area is in semi-desert, which is divided into five subdivisions according to soil. Three of these forest types exist in the study area namely, *Acacia tortilis*, *Maerua crassifolia* Desert scrub, semi-Desert Grassland on sand and *Acacia mellifera*-Commiphora Desert Scrub (Harison & Jackson,1958).

The study area also includes low rainfall savannah on sand (*Acacia senegal* Savanna). Other species found are the *Combretum – Cordofanum – Dalbergia – Albizia sericocephala* woodland. In depression in the sand into which a little clay has been washed, *Adansonia digitata* is often found together with *Acacia nubica*. The dominant grasses are *Aristida*, *Pallida*, and *Eragrossitis tremula* and *Enchrus biflous* (EL amin, 1990).

## **2.5 Soil**

The soil in the study area is classified into four main types: Goz soil, Gardud soil, alluvial flood plain and fluvial. The stabilized sand of the Goz soil is poor in mineral and organic matter. It has low clay contents (5 – 20%) (SCF,1988). The Goz soils are the natural home of *A. senegal*, and the soils which are cultivated by the local people. The parent material of Goz sand is Nubian sandstone. The Profile development of these soils is poor, and colour is typically yellow, brown or brown- reddish. The sandy soils are overexploited, and previously stabilized old dunes have become reachable. In practice the Goz soils are widely cultivated due to the fact that they can be very easily cultivated by hand. The Goz soils are extremely permeable to water and little is lost in evaporations or run off.

Gardud is a term used for a number of different local clay soil varieties and for heavy non-cracking soils that are impermeable to water. Alluvial flood (Dark heavy clay) soils are prevalent in and around seasonal rivers and they are relatively fertile and swell when brought in contact with water and are suitable for construction of water reservoirs (Hafir).

## **2.6. Economic activities**

There are three main sources of production in North Kordofan State, namely: animal production, forestry and forest products with main emphasis on the production of gum arabic from *Acacia senegal*, and crop production mainly groundnuts, millet, sorghum, Kerkadi, and sesame. Agricultural practices vary

considerably according to soil type, rainfall, and crops prices. Intercropping is widely practiced in the State.

## **2.7 Land Tenure**

There is no crystallized code of land owning in force in Kordofan rural area. The underlying principle is that all land belong to the government and is occupied by tribes on the communal system. By custom the spheres of influence of the tribes and its subdivision have become either by natural agreement or by boundaries, and this area is thus Known as tribal or village land (Blunt,1926). The tribe chiefs have set up traditional rules to organize land tenure. The prevailing type of land use is a small-holder owning between 5-40 feddans. Garden are mixed with cultivated pockets, because of the alternating use of land between cropping and hashab restored on abandoned plots (Hunting Technical Service. 1977).

Duration of 20 years between the growth of hashab tree and its cutting at old age was identified by the research of Kordofan Special Fund Project 1962-1967. That was the practice under the situation of land abundance and a balanced rotation of cropping and fallow. There is evidence that the hashab cover has diminished considerably in most places across Central Kordofan, due to population growth, expansion of cultivation, overgrazing and drought (Gasmelseed, 2000).

## **2.8. Population**

The population of North Kordofan State was estimated according to 1993 national census as 1.327.066 classified as rural settled 948130, Nomadic 67790 secondary and urban 311.146 (Ministry of Finance and Economics, 1996).

The hashab belt extends over central Kordofan embracing a diversity of tribal groups. From east to west, the main groups in Um Ruwaba District are Gawamaa, Gemie, and Habbaniya; in Bara District they are Giledat, Nawahia, Awlad Agoi, and Maganeen; in El Obeid District they are Bederiya, Sabaha, Shiweiha and

Dago; and in En Nahud District they are Hamar and Gawamaa. All the above groups are settled rain-fed cultivators living in villages and owing hashab gardens as part of the fallow- cropping system.

The distribution of the population within North Kordofan State is variable and increases from the north to the south according to increasing rainfall figures. Despite the relatively low population density, over-population is obvious in certain parts of those regions that are affected by desert encroachment. The concentration of people results from the low soil productivity on one hand and lack of water during the dry seasons on the other hand.

According to the migration pattern there are three types of migrations found in North Kordofan State (Gasmelseed, 2000):

1. Migration to the water points: it is a common phenomenon all over the gumbelt, but strongly in North Kordofan. Permanency and security of availability of water as well as the time needed for water fetching leads to concentration of settlements in the neighboring water points.
2. Nomads: The regular movement of the people with their animal searching for grazing land and water is predominant in Kordofan. According to the climate seasons in the area their movement is directed northward in the rainy seasons (June – August) and southward in the on going dry seasons (October – December).
3. Labor migration: migration of labor in the Sudan provides an important regulation process for regional disparities in employment opportunities, allowing for additional income to people. Due to its limited resources and increasing population, Northern Kordofan over all is an area of surplus labor.

## **2.9. Development Projects in North Kordofan**

### **2.9.1. Background**

There were many different projects in North Kordofan State during the last decade in the field of development. The major one is the Gum Belt Project for Desertification Control (1980-1995). The on going projects up to date are: IFAD at Um Ruwaba and Bara Localities and Plan Sudan on Skeikan locality. The activities of these projects are mainly concentrating on capacity building, and income generating activities. (El Mahdi and Mahony. 1990).

### **2.9.2. The Restocking of Gum Belt Project**

This is one of the biggest projects for combating desertification in the Sudan. It started as integrated Sahel Programme in 1980 with the Swiss-based International Union for Child Welfare (IUCW) as the sponsoring agency. The project became the restocking of gum belt project in 1981 financed through the United Nations Sudano-Sahalian Office (UNSO) on the basis of financial contribution mainly from the Netherlands for development cooperation. The project has been designated as of high priority by the Government of Sudan in their strategy to combat desertification and is contained in the Government's Desert Encroachment Control and Rehabilitation Programme (DECARP) as formulated in 1976 in collaboration with the United Nations Environment Programme (UNEP), Food and Agriculture Organization (FAO), and the United Nations Development Programme (UNDP) (DECARP, 1976).

The project was designed in three phases: Phase 1 commenced in 1981 with UNSO assistance made possible by a grant from the Government of the Netherlands, and was formulated to initiate the reversal of environmental degradation in the gumbelt of Kordofan region and to reintroduce economic activities suited to the ecology of the area. The immediate objective of phase 1 summarized as the rehabilitation of gum gardens through the provision of seed, seedlings and extension inputs to farmers for the dual purposes of desertification



control and of enhancing the productivity of the area with special emphasis on women role. The project provided for the establishment of an extension services through which the immediate objectives were to be achieved. Phase 1 was immediately followed by phase 11, ending in June 1989, with the aim of expanding the achievements of phase 1. Phase 111 began in January, 1991 and extended until the end of 1995, basically as a continuation and expansion of the earlier phases. Activities were undertaken to meet two objectives via: creation of self-reliance within rural communities; and consolidation and expansion of previous achievements.

The major change that introduced in phase III was that the concept expanded to promote the maximum financial return from gum arabic production for both past and future project participants through the formation of farmer's associations, which are intended to reduce dependency on the traditional "Sheil" system. The project is based on the provision of extension inputs through ten extension centers in three districts of Northern Kordofan and to enable local communities to become self-reliant in reversing the trends of environmental degradation by the end of the project period (UNSO, 1989).

### **2.9.3. Establishment of Associations**

The gum belt project promoted the formal structuring of farmer groups into registered Farmer's Associations. The initial Associations comprised farmers whose income derived predominantly from the production and sale of gum arabic. The project assisted the establishment and effective implementation of twenty Farmer's Associations by the end of 1994. Moreover FNC established additional twelve associations after termination of the project until 2001.

A major aim of these Associations is to maximize the farm-gate returns to rural communities through skills transfer particularly by improved tree tapping; value added by cleaning, grading and packaging; and collective delivery and marketing.

Relevant components of this transfer will also be available for commodities other than gum arabic. A lot of efforts were done to increase farmers' technical know-how and raising of their managerial skills through specific skills training, workshops, and field-days for both Field Extension Agents (FEAs) and Associations committees (chairman, treasurer and secretary).

In 2002 FNC evaluated the activities of the associations in Northern Kordofan State in one day seminar and field day attended by all stakeholders from different agencies and agricultural ministers from six different states familiar with gum production. The workshop recommended the replication of the model of the associations all over the gum belt in Sudan. In 2003 the FNC proposed to the Ministry of Finance to employ 115 forestry graduates to organize the establishment of Farmers' Associations in gum producing states in Sudan. Up to date about 250 associations were established in Blue Nile, Upper Nile, Western and Southern Kordofan, Gadarif, Senar and North Kordofan.

## **CHAPTER III**

### **LITERATURE REVIEW**

#### **3.1 Introduction**

Land degradation, which is synonymous to desertification, has become one of the most serious environmental problems in Africa, particularly in the drylands. It is a chronic problem that undermined food production (Awuor 1997). Within the last decade, more than 20 countries in Africa have faced drastic food shortages as a result of land degradation and productivity decline beside extended drought spells (Otinda, 1997).

In arid and semi-arid areas of sub-Saharan Africa, drought is one of the major causes of desertification. Sudan's arid and semi-arid ecology is mainly influenced by climatic factors including the total amount and distribution of rainfall. Soil type, topography and elevation also affect and determine the degree of desertification to a more limited extent. There has also been the issue of increasing human and animal population translating into over-exploitation of natural resources through overcultivation, overgrazing, deforestation and poor irrigation practices (Akumu, 1997).

Desert encroachment in the Sudan is assumed to be a man-made phenomenon. Reforestation and forest protection policies throughout the last two decades have lagged behind the level needed to ensure that the forest capital is maintained. Steady deforestation that has occurred over the last twenty years under the combined effects of agricultural encroachment, fuelwood harvesting, and overgrazing has reduced the forest area by 20% and has been a contributory cause of accelerated desertification (World Bank, 1986; Ministry of Agriculture and Forests, 1996).

### **3.2. Participatory Forestry**

In Sudan, among the different options of the Forest Policies, there was special emphasis on the role of the forests in environmental protection and the establishment of community, private and institutional forests. Participatory forestry as a concept is not new. It has been well established for centuries in many countries. The main functions of participatory forestry include establishment of protective forests and the creation of “village forest areas” or “urban phalloid areas” (Shepherd, 1990). During the last decade the understanding of the importance of forestry for local communities has been recognized and became apparent. To stimulate forestry and crop production in rural communities, new approaches should be worked out to overcome the various obstacles, which have limited the acceptance of forestry by local communities in the past. Gradually several responses to the limiting factors for forestry development in rural areas have been recognized (Wiersum, 1984).

The success of participatory forestry programs, irrespective of the models, depends largely on effective people’s participation at various stages of their implementations. Many social forestry programs have stumbled along and eventually faded away. The downfall of these programs is partially a result of the non-integration of social forestry projects within the field of rural development and partially a result of implementers who did not seek the active participation and involvement of the local people (Sen and Das, 1987).

### **3.3. *Acacia senegal* Tree**

*Acacia senegal* occurs naturally in a belt 300-km wide extending through the southern frontier of the Sahara desert. Based on Harrison and Jackson (1958) classification of the vegetation of Sudan, *A. senegal* occurs in a number of vegetation types ranging from the semi-desert grassland zone in the north to the *Terminalia-Sclerocarya-Anogeissus-Prosopis* savanna woodland. The Hashab tree

(*Acacia senegal*) is a shrub or small tree 2-12 meters high. Bark is yellow to light brown or gray, rough, fissuring or flaking. It occurs on sandy and clay plains in short grass savannah forming a continuous belt from east to the west in central Sudan. It is more common on the western sand plains of Kordofan and Darfur as pure stands or associated with *Acacia mellifera*. The tree is very drought resistant and grows with annual rainfall between 100 mm to 800 mm, mainly between 300-400 mm with a dry period of 8-11 months (El amin, 1990 ).

Sudan is the world's largest producer of gum arabic and its annual exports of gum arabic range between 20 – 40 thousand tons (FNC 1998). The commercial gum arabic is a product of *Acacia senegal*. Moreover, this tree has an important role in fulfilling household wood energy and fodder demands. Its important advantage is to enrich the soil through its ability to fix nitrogen (Badi, 1989).

### **3.4. Forest Cooperatives**

#### **3.4.1. Definition**

A forestry cooperative is a type of normal cooperative, which is a member-owned business enterprise. The idea behind a forestry co-operative is to apply the idea of a member-owned business to a situation that includes forest landowners. So, private, nonindustrial landowners are involved and become members of a co-operative to get various services and goods through the co-operative (Gray *and lang*, 1995)

According to the University of Wisconsin Center for Cooperatives, "forest landowner cooperatives have existed in Europe for more than half a century and in the United States for close to 100 years." Yet, despite their long history, forestry cooperatives are not as prevalent as one might think. However, a recent groundswell of interest in landowner cooperatives may change that. Beginning in the late 1990s, particularly in the Midwest, groups of landowners started forming cooperatives, resulting in the

sustainable management of approximately 56,000 acres of nonindustrial private forestland (Henderson and Leech, 1994).

### **3.4.2 Forestry Cooperatives**

Forestry cooperatives can pool the resources of forest landowners to improve the condition of the landscape, add value to local forest products, and promote the region's economic development. For example, the Sustainable Woods Cooperative (SWC) of southwestern Wisconsin combines its members' certified forest management with a cooperative ownership structure for sales of certified wood products from members' forests. SWC's members include 150 private landowners in eleven counties that together built a sawmill and hardwood manufacturing facility to produce and market certified wood products. They collaborate with two other cooperatives: the Hiawatha Sustainable Woods Cooperative with more than 80 members and the Kickapoo Woods Cooperative with more than 35 members. Together they form the largest forest cooperative in the Midwest (<http://www.nemw.org/forestecon.pdf>)

### **3.4.3. Services Provided by Forestry Co-operatives**

There are four types of services that a co-op might provide for its members. The first one is in the area of marketing: this has received a lot of the attention right now, with the notion of value-added processing that the co-op would harvest wood from people's land and then sell it to someone else down the product chain, and landowners can capture more of that value-added. It could also be things like joint timber sales, or joint marketing of timber sales, or having a joint woodyard. The second thing is a supply cooperative. That's where a group might band together to purchase various goods. An example in forestry is bulk purchasing of trees for the members and buying them at a bulk rate, and passing that discount on to their members. A third example would be providing some type of service. in this case, it might be providing some kind of professional forestry service. May be

the co-op has a forester on retainer or employs a forester who provides services to the members at a cheaper price than a landowner might be able to find outside the co-op. The fourth and last one, it's probably very present in this current, new wave of cooperatives, is the idea of education. Co-ops provide their members an education about forestry. Not only going to a field day, but actually going out and trying to do some of these practices on the ground, that's another way they help their members become better managers of the land (Keyworth, 1994).

### **3.5. Systems of Classification of Forest Cooperatives**

Among other reasons, many forestry cooperatives exist to help their members find the information and resources that they need in order to make good decisions about their land. So one might expect a higher quality of management on co-op member lands. But, it's hard to make conclusive statements about actual on-the-ground impacts that result from membership in a cooperative. This is an important area for future research (Henderson and Leech, 1994).

The provinces of the present German Federal Republic have never (save from 1933 to 1945) been subject to a uniform and highly centralized authority, and the number of units constituting the territory has continually varied: as a result, the forms of forest cooperatives are highly varied. If, therefore, it is desired to reduce to some order all the possible varieties of cooperative which might be envisaged by modern legislation, the German authorities might well be followed in the matter. Simon and Orlin, (1979) divides co-operatives into two main categories:

- **Ownership cooperatives:** these, in the strictest interpretation, are easy to imagine less rigid forms in which, for instance, while the forests are managed as a unified whole, the separate constituent areas remain individual and, under certain circumstances, may be withdrawn from the cooperative.

- Economic cooperatives: in such cooperatives, each proprietor retains full ownership over his land and its cover. The collectivity confines itself to the development, or to phases of the development, of those elements.

Simon and Orlin, (1979) makes a distinction between restricted and full cooperatives. In the restricted cooperative, the responsibility for treating his own woodlands is left with each owner, and in this case the cooperative may be referred to, according to its purpose, as a cooperative for protection, supervision, administration, extraction, or management, the latter being the form which is most strictly binding on the parties. In the full cooperative, on the other hand, the whole of the woodlands grouped in the cooperative are managed according to a common working plan. Each co-operator receives from the cooperative's revenue a return in proportion to the capital value of his land and its forest; the woods, however, remain his property, and he takes personal care of the operations carried out upon his property. Mascher (1954) has worked out a much more complex classification for cooperatives, more from the legal standpoint as:

Associations formed under private contract: these include: associations not having juristic status, and associations having juristic status; (among these, there is a further distinction between profit-making and nonprofit-making associations) and, partnership associations. The later have a juristic status and are distinguished by their being commercial in character and by their activities not being necessarily confined only to fulfilling the needs of their members (Coughlan, 1996).

Other types of classification of forest cooperatives include: associations formed under public law. These are associations of which the constitution, membership and legal status are governed by public law, while the administration is directly ownership cooperatives, full economic cooperatives and restricted economic cooperatives (Gomez, 1996).

### **3.6. Sustainable Forestry Development through Forestry Cooperatives**



In Korea, forestry activities have traditionally been accomplished by the government, private sector and Forestry Associations. Forestry Associations in Korea are based on the rural people's self-regulated organization from the 15th century, named "Sanrimgae" for forest protection. The Sanrimgae have been reorganized into modern form for the 20th century. The modernized Forestry Association's main purposes are supervision of forestry related business affairs including execution by proxy of government forest projects, establishment of the foundation for self-supporting operation, systematic organization and structure adjustment. However because of the Forestry Associations two purposes for establishment, the two development way, the different membership in unit level, it is reasonable for Forestry Association to change into the Forestry Cooperative, the purpose of which should be the economic one of protecting the member's welfare. It means that the organization for forest owners excludes the government's interference on Forestry Association up to now (FAO, 1996).

Government has supported about 770 forest technical guides to the provincial Forestry Associations during the past 10 years, who can consult with forest owners and can provide the advanced forest technical and economical information. However because of economic weakness of forest management, the forestry guidance project faces financial constraints. The forest land owners feel uncomfortable with the Forestry Association's negative or inadequate activities and complain about that. Therefore, for the future development of Korea's forestry, it is essential to have the forest owner's voluntary participation, and it is also urgent for the Forestry Associations to be able to accomplish their organizational constitutional development (Astorga, 1990).

The Forestry Cooperatives, which are non-governmental forest organizations, play important roles in implementing the forest owner's activities. The goal of Forestry Cooperatives is to manage their forest rationally by enlarging management scale

through cooperating production elements such as forest land, labour, and capital of the small-scale private forest owners, and to improve the socio-economic position of the members (FAO, 1996).

In 1993, the Forestry Associations were reorganized into Forestry Cooperatives, whose members are forest owners who want to voluntarily participate. For the cooperatives predecessors, the Forestry Association, membership included all forest owners and village residents in mountain areas for reforestation and forest protection. For this, "Forestry Cooperatives Law" replaced the "Forestry Association Law" in the same year (Astorga, 1990). Now the Forestry Cooperatives have 2 levels, one is the unit level in 142 Provinces, and the other is the Federal Cooperatives of which the individual forestry cooperatives are members. The former Forestry Association had 3 levels, and units were village forest associations composed of forest owners and neighbours in the village. It was a useful mechanism for government to reforest and protect the forest surrounding the villages. The number of the unit associations was about 20,000, and the number of the middle level organizations "provincial forest associations" (which had the unit village forestry associations as members) was about 142. The Federal Association had the provincial Forestry Association as members. However it is more helpful for forest owners if there are reduced levels in the organization, because of multi-level disadvantages for sustainable forestry development. Between now and 2010, the 3rd level, "Sanrimgae" will be disbanded and will disappear. After 1993, there are many changes in Forestry Cooperative's activity, and a lot of advantages for sustainable forest management in Forestry Cooperatives' business (Chamber, 1986).

### **3.7. The Diversity of Forestry Cooperative's Business**

The current business of Forestry Cooperatives includes planning of reforestation, management and harvesting, collection, storage, selling of forest products, and loans of forest funds. Among them, the silviculture for the member increased 2 times in 2 years from 1993 to 1995, and by-product marketing such as mushroom also increased 1.8 times. Federal Forestry Cooperatives are also considering to supply the drinking water, which is produced in mountain areas, to urban people to increase the efficiency of member's forest management (Wilson *et. al.*, 1994).

### **3.8. The Strengthen of Financial Support by Government**

To stimulate the activity of Forestry Cooperatives, Government also increased the financial support for the small-scale forest owner. Especially the special financial subsidy increased 4.4 times in 2 years. With this Federal Forestry Cooperatives started the mutual financial business in 1994, and 57 Forestry Cooperatives joined this business, and the total amount is about 0.2 billion dollars in 1995 (Chamber, 1986).

### **3.9. The Construction of International Cooperation for Sustainable Forest Management**

The sustainable forest management (SFM) is the core target for the 21 century. Fortunately, Korean Forestry Cooperatives were permitted to get the membership of the International Cooperatives Alliance (ICA) in June 1996, and it would be the good chance to strengthen the cooperation for sustainable forestry development with the other countries in future.

([http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/003/W5547E/W5547E07.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/W5547E/W5547E07.htm))

## **CHAPTER IV**

### **METHODOLOGY**

#### **4.1. Selection of the Study Area**

Although the gumbelt extends in a belt covering devastated areas of many states, farmers association for marketing and development of gum arabic exists only in North Kordofan State. This is why this research is confined to North Kordofan State. Within North Kordofan State the gumbelt project established ten extension centres in three localities (Um Ruwaba, Sheikan, and Bara). Only three extension centres established farmers associations since 1992 in part of Um Ruwaba and Sheikan rural councils and the total number of farmer's associations is presently 25. To tackle the issue of farmers association, therefore, this research is confined to the areas where farmers' associations exist. Moreover, some villages in areas no farmers' associations were considered in the research to highlight their awareness about farmers' associations. Two are from Bara locality and the other two are from Um Rawaba locality, ( Um Kredim rural council and El Rahad rural council)

#### **4.2 Sample Selection**

Sampling was based on two stages of selection. In the first stage villages were selected and from villages respondents were selected.

##### **4.2.1 Selection of Villages**

Selection of villages was made by stratified systematic sampling according to the distribution of existing Farmers' Associations in the Gum Belt Project on the three extension centres in Um Ruwaba and Shekan Localities (Um Ruwaba, El Semeih, and El Obied centre). Six villages were selected from the three centres two villages from each. Four villages were selected from two extension centres (El Rahad and Um Kredim ) where there is no farmers' associations.

##### **4.2.2 Selection of Respondents**

The sampling percentage of the selection of the respondents was 5% of the total members of the association. The selection was based on the prehand membership lists receiving credit for tapping from FNC for the year 2003. Moreover, a separate set of questionnaire was formed targeting the associations committee in each selected village (Chairman, Treasurer, and Secretary). (Appendix II). Also there are other two separate set of questionnaire for farmers association areas and farmers in area of no associations (Appendix III and IV)

Table (4.1) shows the selected villages, total number of participants in the farmers association and the selected respondents.

**Table (4.1): Selection of the target group from the study area**

Center	Association name	Total members	Selected respondents
Um Ruwaba	* Um Gezera * El mrehabeba	146 300	7 15
El Semeih	* Um SerehaAbdel Rahim * Um El Sheikh	400 350	20 17
El Obeid	* El Sunut Sharg * El Sunt Gharb	120 100	6 5
<i>Sub-total</i>	6	1416	70
<i>Um Kredim</i>	*Um Kredim *Shiriam Kramsha	160 142	8 7
<i>El Rahad</i>	* Tayba * Fangoga	121 182	6 9
<i>Sub-total</i>	4	605	30
Grant-total	10	2021	100

### 4.3 Source of Information

In this study, two types of data were collected to provide the necessary information, namely; primary and secondary data. The source of the secondary data includes FNC documents, files, articles, and annual reports. The primary data were principally collected to investigate the level and willingness of the people to adopt the innovation of farmers' associations through the extension efforts. More

specifically, the data cover the main items of the objectives of the study mentioned in Chapter I.

#### **4.4. Construction of Questionnaire**

The broad questions of this set of questions were formed to tackle and explore the views of the members of the associations, and the main points were:

1. General characteristics of the respondents (sex, age, education, occupation, marital status, and family size).
2. Gum gardens profile (total area of Hashab, data concerning tapping of hashab trees)
3. The situation before and after the establishment of the associations (area of hashab after establishment of associations, tapping techniques, tools used, costs)
4. The economy Gum production (tapping and harvesting costs of gum, average production/tree/mukhamus, total income from gum three years ago).
5. The main roles of the associations.
6. Benefits of hashab trees rather than gum beside exploring the main factors threatening the existence of the tree and gum production
7. Proposals for promotion and development of the associations.

While the self-adminstred questionnaire targeting the members of farmers association committee focusing on the following key issues:

1. historical development of the associations and the membership
2. Training in the different fields of gum production.
3. Membership (criteria and conditions of membership and factors hindering the involvement of new farmers).
4. Credit accessibility, the donors, eligibility for credit, procedure to get credit, distribution among members, repayment, credit problems,
5. Proposals for improving repayment and getting loans.

## 6. Relation with FNC, means of communications and contact.

The construction of the questionnaire was made according to the guidance of FAO (1985). The suggestions of the supervisor as well as ideas of other experts in the field of study helped to reach the final format of the questionnaire. The following guidelines of Burchinal (1986) were also given special consideration in the construction of the questionnaire:

- To be certain that each question was relevant and necessary to the topic
- To ask the questions that the respondents can and are willing to answer
- To express each question as simply as possible
- State questions in specific concrete terms
- To obtain criticism of all prepared items by a colleague or a friend
- State the items in the language respondents use in everyday conversation.

Two types of questions were used in the questionnaire. Closed-end questions, with mostly multiple choice or yes and no style of answers, and dichotomous questions in step-wise style, each answer leading to a specific set of follow up questions with no open-ended questions except where it is inevitable. These types of questions were used in the questionnaire in order to:

- Make the least demand upon respondents
- Permit quick, efficient collection of data
- Permit easy, quick and accurate analysis of answers.
- The combination of question and associated response categories sometimes help respondents to understand the questions more clearly.
- They are more useful in obtaining answers to sensitive questions.

The open-ended questions were avoided except where it is inevitable because of their negative drawbacks, which are represented in:

- The difficulty of constructing questions at the proper level of generality.

- Responses are difficult to analyze and summarize.
- They may impose considerable burdens on respondents and interviewees.
- They are more likely to produce irrelevant and worthless data.

#### **4.5. Organization of Data**

The conceptualization step was followed by the organization of the questions. The following guidelines were considered:

- To begin with simple, easy to answer questions.
- To place sensitive or more complex questions late in the questionnaire.
- Where it makes sense, to place the items in logical order.
- To try to create an interesting mix of items within the questionnaire.

An introduction was set to the questionnaire at the top of the first page or faces sheet of the questionnaire, the introduction was written in short, simple sentences in the local language used by the respondents and in words they understand. The introduction was composed of the following elements:

- Identification of the person conducting the research.
- Explanation of the purpose of the study and why it is important.
- Explanation of how the respondents were selected.
- Assurance that answers would be protected and not made known to anyone else to assure confidentiality.

#### **4.6. Pre-testing**

The formulation of the questionnaire was followed by a pre-test step to discover and correct any flaw in it. The purpose of the pre-test is to make sure that the questionnaire would deliver reliable and valid data for answering the problem under investigation.

The final year students of Faculty of Forestry, university of Khartoum, as a part of their study course, were asked to critique the questionnaire, and to estimate how



the respondents will be able to respond to the questionnaire. According to the comments of the students, the draft questionnaire was revised. Finally, the supervisor checked the questionnaire, and accordingly, some questions were removed. After the pre-testing, the contents of the questionnaire were materialized into simple forms with minimum items to obtain necessary information. The questionnaires were finally revised and printed (Annex (1)).

#### **4.7. Team of Data Collection**

The team comprised of six qualified and widely experienced extension officers, three males and three females. The selection of the team members was based on the following criteria

- 1 They are residents in north Kordofan state.
- 2 They speak the same language, share similar culture and have a farming background.

For reliable data collection through questionnaire, the researcher trained interviewers for two days on general orientation regarding the nature of work, techniques of interviewing and processes of data gathering. The data was collected by face to face interviews, the interview started by a general talk and a brief explanation about the nature and objectives of the study to gain the trust and confidence of the respondents to ensure the most possible reliable data. Data was collected during the period Mid September – Mid November 2003.

#### **4.8. Statistical Analysis**

The statistical analysis commenced through exploratory manipulations of the data obtained in the study area. This process was accomplished by critically examining the data through the use of simple techniques of analysis. The main tools are the construction of simple tables and selected cross-tabulation which allows tentative answers to many of the questions being asked in the survey.

## **CHAPTER V**

### **RESULTS AND DISCUSSION**

#### **5.1 General**

The main innovative activities in Phase III of the Gum Belt Restocking Project in North Kordofan emphasized the objective of creating self-reliance activities in rural communities. This was targeted through the establishment of Farmers Associations to optimize economic returns to rural communities by value-adding to gum as well as collective marketing. The self-reliance objective was also to be met by seedlings production in village-owned nurseries or by seeds from their gum gardens to replace the provision of seedlings to farmers by FNC central nurseries. Hence the study of the socio-economic parameters of the stakeholders in the study area is very important.

Two groups of respondents were considered in the study (members in Farmers' Associations and uninvolved stakeholders) in order to have a chance of making comparisons between the two groups with respect to different variables governing the associations and their contribution to the rehabilitation of the gum belt zone. A random sample of 82(52+30) respondents was taken from the two groups using 5% sampling percentage. Six villages from sites where associations exist were considered in this research (52 respondents), namely; Um Gzera, Mrehbiba, Um siriha, Um Elshik, Suntshrg, and Sunt Grb. While for the control four villages were considered in the study (30 respondents) namely; Tayba, Fangoga, Shiriem, and Um Kiredim. Moreover, a sample of 18 respondents representing the members of the villages committees was considered for the validation of findings and to cheque if there are any ambiguities in the results.

## 5.2. Establishment of Farmer's Associations and Committees

The establishment of the farmer's associations was started in the different sites between 1992-1996 as asserted by 83.3% of the interviewed sample. This period coincides with the last phase of restocking of gum belt project. While the rest of the respondents (16.7%) claimed that the establishment of the association took place between 1997-2001 (Table 5. 1). This indicates the ability of the project in sustaining the activity and disseminating the innovation even after the phase out of the project. This variation may be attributed to the fact that the idea of the formation of farmers associations started at specific sites and replicated at other areas.

**Table ( 5.1): Establishment of farmer's associations and committees**

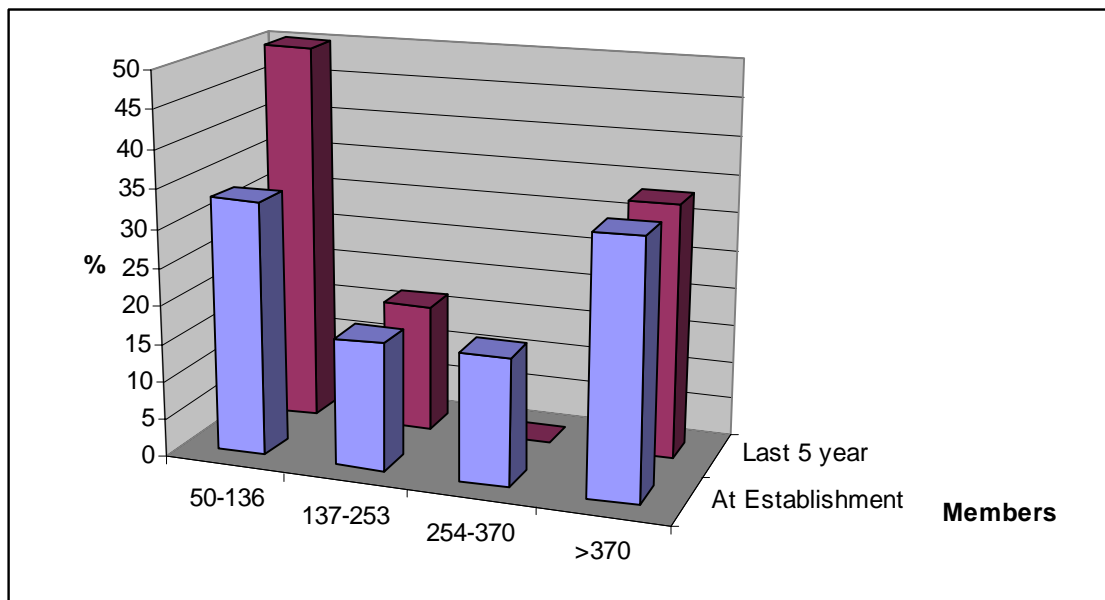
Character	N	Date of establishment		Date of election		Occupation
		92-1996	97-2001	92-1996	97-2001	
Chairman	6	27.8	5.6	22.2	11.1	33.3
Secretary	6	27.8	5.6	22.2	11.1	33.3
Treasurer	6	27.8	5.6	27.8	5.6	33.3
Total	18	83.3	16.7	72.2	27.8	100

As far as the selection of the villages committees to run the association is concerned, it coincides with the establishment of the association as asserted by 72.2% of the community leaders. The rest of the respondents (27.8%) declared that the selection of the committee was made between 1997 – 2001. This indicates that some associations were formed but the procedures of committee selection was delayed for various reasons.

The participation of stakeholders in the associations is outstanding each day new commers adopt the innovation. Figure (5.1) shows the number of participants in

the first five years of establishment of the associations and the last five years i.e after the phase out of the project. From the figure below it is clear that 33.3% of the associations at establishment have 20-136 members, and similar percentage (33.3%) have more than 370 members. According to FNC reports there is association with membership less than 75 persons which is a prerequisite for establishment of association according to the Cooperative Department Law of 1925 of the Republic of Sudan, which stated that the minimum numbers of productive cooperative must be 75.

**Fig. (5.1): Participants of farmers associations in the study area**



In the other parts of the world the lower limit of participants for sake of association establishment is much lower than this figure. In Sweden, for example, the lower limit of participants is five, but may be only three if those persons themselves represent societies. The number in Japan is ten in the case of facilities associations, and five in that of "production associations". Japanese law even goes into details regarding the procedure to be adopted for meetings of founder members, for the drafting of the association's articles, and for the holding of the

first general meeting to approve the draft. The membership in the last five years showed a dramatic increase as shown in the above mentioned figure.

### 5.2.1 Conditions for Membership

All the members of the villages' committees are farmers and possess gum gardens, and this is considered as the main criteria of membership in the association. (Table 5.1). Also there are other conditions for membership of the association (Table 5.2.).

**Table( 5.2): Conditions for membership in the associatons (%)**

Characte r	N	Hashab owner	Residenc e	Follow instructi on	produc er	Honest	Fees
Chair man	6	33.3	22.2	27.8	11.1	5.6	5.6
Secretar y	6	33.3	22.2	16.7	11.1	0	5.6
Treasure r	6	33.3	16.7	22.2	16.7	16.7	22.2
Total	18	100	61.1	66.7	38.9	22.2	33.4

The second, and most important condition is the commitment to all instructions and guidance provided by the association as stated by 66.7% of the interviewed sample. Residence is considered as an important condition for membership in the associaton as asserted by 61.1%. Other criteria of membership include engagement in gum production, commitment of paying membership fees, honest and repayment of the credit with 38.9%, 33.4%, and 22.2%, respectively.

Although the adoption of the innovation of the associations in the study area is high, still a considerable proportion of gum producers were not recruited or encouraged to join the associations. Table (5.3) furnishes the information about

the approximate numbers of unregistered gum producers in the study area and the reasons confronting their membership.

**Table( 5.3): Producers not members in associations**

Character	N	Not member %	Reasons %			Their number%	
			NO reason	Personal reason	Dislike	68-96	126-154
Chairman	6	11.1	5.6	0	5.6	5.6	5.6
Secretary	6	11.1	0	11.1	0	5.6	5.6
Treasurer	6	11.1	5.6	0	5.6	5.6	5.6
Total	18	33.3	11.1	11.1	11.1	16.7	16.7

The above table shows that 33.3% of the inhabitants within areas of farmers' associations who possess gum gardens are not members in the gum producers associations. One third of this group have no vital reason for not joining the association. Another one third attributed their lack of involvement to personal reasons, while the rest claimed that they mistrust communal work due to the pitfalls of the other cooperatives in the study area. This may be attributed to the lack of enough confidence and mistrust which could easily be revoked through the extension. This agrees with Coughlan, (1996) showing the Austrian law requires that the purpose of cooperatives and associations must be set out in their articles, and must clearly emerge from their titles. In this way, intending members shall not be misled, and any tax exemptions applicable to such associations can be easily

determined. On the other hand it seems that the conditions of membership is behind the unregistered farmers. In other parts of the world the membership is open to all, not subject to any restrictions. Carney (1998) stated that the latest Swedish legislation particularly emphasizes the principle of unfettered membership and points out that an economic cooperative cannot refuse a request for membership unless for some special reason connected with the kinds of activities or aims pursued by the company, or other reasons of a similar kind.

### 5.2.2 Training and Fields of Training

ABARE (1995) showed that it is expected that by being aware of the various techniques in forest development and the methods of encouraging community participation, the trainees could develop more confidence and increase belief in the idea that a more rapid forest development can be attained. The reasons for conducting training should be given in the rationale, and the problems should be identified as well as how the training can solve them.

**Table (5.4): Training and field of training**

Character	N	Trainers		Fields of training				
		Project	Other	Meeting	Filing	account	Tapping technique	Ideal harvest
Chair man	6	22.2	11.1	22.2	22.2	22.2	22.2	27.8
Secretary	6	22.2	11.1	22.2	22.2	22.2	22.2	27.8
Treasurer	6	27.8	5.6	27.8	27.8	27.8	27.8	27.8
Total	18	72.2	27.8	72.2	72.2	72.2	72.2	83.3

The majority of the committees' members (72.2%) were subjected to training sessions. The gum belt project was the main body responsible for training of the committees' members as stated by 72.2 per cent of the interviewed sample. While the rest of the respondents asserted that there are other institutions exposed them

to training sessions like IFAD project. The main fields of training were: meeting organization, filing system and book-keeping, accounting procedures, tapping techniques and ideal gum harvesting (Table 5.4). IFAD project trained farmers in capacity buildings. Despite the need for refreshment training sessions, the FNC policies and efforts are concentrated mainly on extension services on hashab management, tapping techniques, and gum ideal harvesting, cleaning, storing and collective marketing of gum within the association areas. The training of the Associations committees can be held if there are sponsored agency or organization to deal with gum production and hashab management in associations areas. Since the main objective of the gum gardens is economic benefits (financial), group discussion methods is the best mean through which farmers could be encouraged and convinced by the policies and strategies of the FNC. Fenton (1989) stated that group discussion is a democratic method, giving equal opportunity for every participant to have his say, also small group can think together on a problem in an informal fashion and workout solutions better and faster by using this method than by following rigid parliamentary procedure. It also creates a high degree of interest

### **5.2.3 Credit Accessibility**

From the documents of the Restocking of the Gum Belt Project for Desertification Control in North Kordofan Phase III, following the successful experience of the ILO/FRG Trust Fund Project for establishing a revolving fund "sanduk" for income generation activities in the Eastern Region, the provision of credit through "Sanduk" system and training in management for Farmers' Associations was intended to be a core for a rural bank. Using the project's revolving fund allocation as a grant, it was envisaged that the Sanduk will evolve as a permanent and sustainable credit institution. The project grant was expected to represent seed capital, and other alternative future sources of funds, from within and outside the rural economy, should be explored, if the Sanduk is to play its envisaged role.



According to the field survey data the above mention strategy is just slogan and not applied on the ground untill the project terminated in 1995. The project of Restocking of the Gum Belt managed to avoid the pitfall of revolving fund "Sanduk" through provision of credit. Table (5.5) illustrats the sources of credit for the farmers' associations.

**Table (5.5) credit and source of credit**

Character	N	Credit %	Source of credit %		
		Receive credit	FNC	KPC	Khurtoum Enterprises
		Yes	Yes	Yes	Yes
Chair man	6	33.3	33.3	5.6	5.6
Secretary	6	33.3	33.3	5.6	5.6
Treasurer	6	33.3	33.3	5.6	5.6
Total	18	100	100	16.7	16.7

All the respondents in the study area received credit from FNC in 2003, while some others (16.7%) received credit from Khartoum Processing Company (KPC) and 16.7% received credit from Khartoum Interprices for Gum Processing. From the above table it is clear that some respondents received credit from more than one source. It worthmentioning that this credit is not continous and sporadic, moreover, it is not distributed systematically across the study area. it seems that the other insititutions introduce credit facilities during years of highly expected yeilds of gum arabic. Parnell (1995) showed that the system of credit to forest world wide, the governments usually act as guarantors. The Svenska Jordbrukskreditkassan or Swedish Federation of Rural Loan Societies, can call upon a basic fund of 25 million kronor in treasury bonds. Central loan societies receive treasury bonds to cover 20 percent of their commitments, with a minimum of 100,000 kronor and a maximum of one million for each society. In Norway, the farmers' short-term credit society (Centralkassen for Bøndenens Driftskredit) receives privileged terms from the State Bank and is thus able to grant loans in its turn to forest owners and their associations. In both Finland and in Sweden,

cooperatives engaged mainly in providing credit facilities for members can be specially authorized to undertake banking transactions themselves under certain conditions. This is regarded as being of particular importance in that they make loan societies less dependent upon borrowing from ordinary banks. In areas of Farmers' associations, there are certain criteria for determining the eligibility of the producers to access credit (Table (5.6)).

**Table (5.6): Criteria for credit distribution**

Character	N	Means of getting credit %			Criteria of credit distribution		
		Members meeting	List of member	Cash delivery	Specific area	ideal gum	Only tapping
Chair man	6	33.3	33.3	33.3	33.3	33.3	33.3
Secretary	6	27.8	33.3	33.3	27.8	27.8	33.3
Treasurer	6	33.3	33.3	33.3	33.3	27.8	33.3
Total	18	94.4	100	100	94.4	88.9	100

From Table (5.6) producers getting credit are followed systematically, as mentioned by the respondents, started by general meeting of the Association members (94.4%), followed by listing of names and total hashab area ready for tapping, and third step is the receiving of cash and its distribution among the members which is controlled by restricted rules and specific criteria. The majority of the respondents (94.4%) showed that the credit must be used for the specific listed area, while (88.9%) said the credit is for production of ideal gum (ideal tapping and harvesting), and 100% said the credit must be used only for tapping.

### **5.3. Members of Farmers Associations**

#### **5.3.1 General Characteristics**

In designing a community forestry activity, the local systems and the responsibilities and benefits for women and men within those systems need to be understood. The call to consider men and women independently when examining development activities has become virtually universal. Yet frequently, the need for such desegregation is justified on the basis of the past and continuing inequity. Development experts should, however, feel compelled to think about men and

women independently, primarily because independent consideration increases the potential for the design, implementation and management of effective, sustainable development activities (Hourihan,1987). Regarding the general characteristics of Farmers' associations members, Table(5.7) shows gender, age groups and family sizes.

**Table (5.7): Gender, Age, and family size**

Village	N	Gender %	Age %			Family size		
		Male	20-35	36-51	>52	2-5	6-9	>10
Um Gzera	7	7.7	-	1.9	3.8	0	3.8	3.8
Merhbiba	15	11.5	9.6	7.7	3.8	7.7	11.5	3.8
Um siriha	20	25	11.5	9.6	3.8	7.7	21.2	3.8
Um Elshik	17	26.9	3.8	11.5	7.7	3.8	7.7	15.4
Suntshrg	6	5.8	1.9		3.8	1.9	1.9	1.9
Sunt Grb	5	3.3	1.9		0	1.9	1.9	0
Total	70	80.8	28.8	30.8	40.4	23.1	48.1	28.8

The majority of the interviewed sample (80.8%) are male and 19.2% are female. In rural area women have vital role in agricultueral practices, in addition of taking care of her family, they work hard in the farm and animal rearing, they participate in gum harvesting, cleaning, and grading, while tapping done by men.

Age groups of the respondents reveal that 30.8% of the respondents fall within the range between 36 – 51years. This reflects the role of the youth towards their communities. Since the youth represent a good proportion, this will guarantee the sustainability of the adopted innovation. This agrees with Garforth (1982) in showing that when a large percentage of the population is youth these young

people represent the farm families of the future, and it is essential that extension does something towards preparing them for that future. While 28.8% of the interviewed sample fall within the range of 20-35 years. This result indicates the absence of migration which is a common phenomena in the past in the study area where the young youth tend to migrate to the principal cities for better job opportunities and income generation. The rest of the respondents have ages greater than 52 years. This group is of a paramount importance with regard to conservation of the natural resources. The indigenous knowledge, which is acquired through time, could be utilized to the maximum for the protection and rational use of natural resources. The age group and the gender issue are among the most important variables, which are given special consideration in the process of development (Chamber, 1986).

As far as family size is concerned, 48.1% of the respondents showed that their families consists of members fall within the range of 6 – 9 members, and 28.8 per cent have family members greater than ten capita. While the rest of the interviewed sample have members between 2 - 5 capita. In rural areas, big families is important to safeguard against labor shortage. The principal source of labor is the household (family labor). Ideally, a man and his wife and their unmarried children make up a task force for agricultural purposes. This is the case in nuclear families. In the case of polygamy, each wife and unmarried children become economic units by themselves. This variable "family size" is an important factor for gum tapping and picking because hired labors represent the bulk of the cost of gum production.

### **5.3.2. Areas of Agricultural Land and Hashab Acquisition**

In the past, *Acacia senegal* gum gardens forms parts of extensive areas over which there was a well defined rotational cultivation – bush fallow system. The cycle starts by cleaning a gum garden in order to grow crops like millet, sesame, groundnuts, hemp and melons. The older gum trees were cut down with a view to

killing the stumps, but younger trees and seedlings are pruned back closed to the ground so as to keep them alive throughout the 4 - 6 years of cultivation. The resulting coppice shoots are cut back during weeding operations, but new growth continued even during the early months of the dry season. This went on throughout the crop cultivation cycle after which the land left to revert to bush-fallow. The new gum gardens, attaining their maximum yield in 7-10 years then cleared again for cultivation after 10-15 years (Born, 1965). The findings of this research revealed that the areas of the agricultural lands of the majority of the interviewed sample (51.91%) possess areas between 1-22 mukhamas (one mukhamas is equialled to 1.75 feddans), while the rest (48.1%) have areas greater than 23 mukhamas.

**Table (5.8): Farms areas covered by hashab**

Village	N	Total area		Hashab area		
		1-22	> 23	2-19	20-37	>38
Um Gzera	7	1.9	5.8	3.8	3.8	
Merhbiba	15	15.4	7.7	19.3	3.8	
Um siriha	20	19.2	13.4	23.1	5.7	3.8
Um Elshik	17	9.6	17.3	13.4	5.7	7.7
Suntshrg	6	3.8	1.9	3.8	1.9	
Sunt Grb	5	1.9	1.9	3.8	1.9	
Total	70	51.9	48.1	67.2	21.1	11.5

The area of of hashab of the majority of farmers (67.2%) is between 2 - 19 mukhamas. This clearly shows the sharp decline of areas asigned for hashab trees which in the past represents 3/4<sup>th</sup> the area. Mohamed (2000) attributed this modification to the increase in the population. Accordingly the rotations have become shorter to provide more income from exportable cash crops. Such crops are given preference to gum gardens as they take less time to produce and, in years of good rain, give more income per unit area than that anticipated from gum gardens. Hence, over cutting of gum trees for cultivation and firewood and over

cultivation has caused deterioration of the vegetation cover followed by sand movement, soil deterioration and desert.

### **5.3.3.Land Tenure System in the Study Area**

Land tenure is one of the most sensitive issues concerning forestry activities. Usually private forestlands are acquired through inheritance. Wilkens (1978) showed that under the condition of inheritance, the ownership is subjected to changes in a form of reduction in land size and as a result trees have to be cleared to provide a vacant lot for the family. In the study area, the state is the real owner of land, trees grown on this land are also considered state property. From interviewing staff in the Restocking of Gum Belt Project, they reported that at the beginning of the project, farmers in most villages in the project areas asked for letters from officials to ensure that the trees they were going to plant would be theirs. The high confidence of farmers has been reached only after first participations in the restocking of the project and after the farmers collected their gum and sold them by their own means. This fact indicates that the life span of the reforestation projects should not be short because trees are long-term investment and their benefits will be available many years after planting (Gasimelseed 2000).

### **5.4. Source of Seedlings and Tapping of Hashab before Establishment of Associations**

Gum production represents a vital source of income generation to the farmers in the study area. Fortunately the different activities of gum production (tapping and picking) do not coincide with the agricultural season. Therefore, gum production provides an additional source of income. Accordingly, considerable proportion of the respondents (73.1%) asserted that they used to tap all their hashab areas. All the respondents of Suntshrg and Sunt Grib villages used to tap their hashab trees.

The rest of the respondents (26.9%) do not tapp their hashab trees regularly (Table 5.9 ).

**Table ( 5.9) Hashab tapping before the establishment of Farmers' Associations**

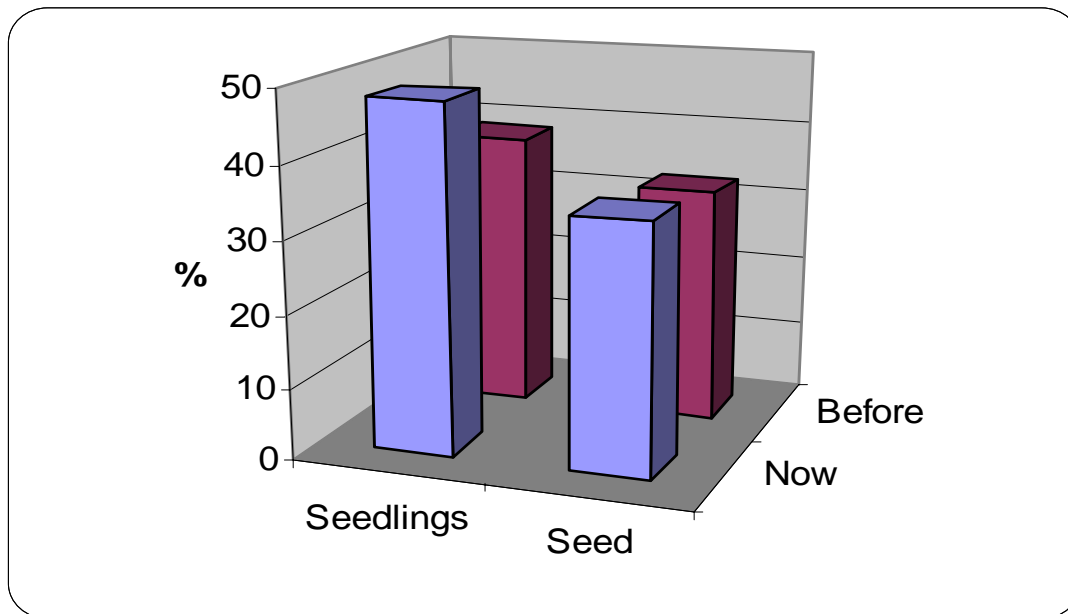
Village	N	Tapped all area %	Reasons for not tapping		Continue Planting %
			High cost %	Low price %	
Um Gzera	7	3.8	1.9	1.9	5.8
Merhbiba	15	11.5	7.7	5.8	17.3
Um siriha	20	26.5	5.8	0	21.2
Um Elshik	17	23.1	0	3.8	11.5
Suntshrg	6	5.8	0	0	3.8
Sunt Grb	5	1.9	0	0	0
Total	70	73.1	15.4	11.5	61.5

The rest of respondents (26.9%) attributed two main factors which restricts tapping of thier hashab gardens, namely the high cost of tapping and the low price of gum with 15.4% and 11.5%, respectively. Despite the low price of gum arabic coupled with high production cost, 61.5% of the respondents confrimed that they were keen to regenrate their gum gardens.

The FNC represents the main source of seedlings before the establishment of Farmers' associations as indicated by 34.6% of the respondents (Fig.5.2). This percentage is considered low for areas working under a project like the Rehabilitation of Gumbelt Project. This finding is supported by 32.7% of the respondents who claimed that they relied on seeds for the regeneration of their hashab gardens. Few respondents (3.8%) showed that they rely on other sources for the provision of seedlings, maily village nurseries. After the establishment of Farmers' associations the FNC intensified its activities particularly provisions of seedlings. Different methods were used for the enrichment and afforestation

activities. The main method is through seedlings as stated by 48.1%, and 34.6% used seeds.

**Fig.(5.2): Methods of hashab regeneration before and after the establishment of farmer's associations**



After the establishment of the association there is an increase of areas covered by hashab trees (Table 5.10). The areas restocked after the establishment of the association increased by 1 - 10 mukhamas as shown by 58.8% of the respondents. While 15.7% showed that their areas restocked by hashab increased by more than 11 mukhamas. After the establishment of the associations there is a tremendous increase of areas and stocking density of hashab trees as assured by 73.1% of the interviewed sample.

**Table (5.10): Areas Rehabilitated after the establishment of the Farmers' Associations**

Village	N	Areas cultivated after associations %	Rehabilitated area %	
			1-10	>11



Um Gzera	7	7.7	5.9	4
Merhbiba	15	19.2	13.7	5.9
Um siriha	20	26.9	23.5	3.9
Um Elshik	17	9.6	9.8	0
Suntshrg	6	5.8	4	2
Sunt Grb	5	3.8	2	2
Total	70	73.1	58.8	15.7

### 5.5 Marketing before Establishment of Associations

There are two types of markets in the study area where gum is sold: village markets and urban markets as indicated by 46.2 and 51.9%, respectively Table(5.11). Village markets are operated on certain days of the week (once or twice a week), and are organized in such a way that people can attend several markets in one week, thus increasing their buying and selling options. In village markets transactions take place directly between producers and consumers. Prices differ from one market to the other and on different days in the same market. They are set primarily through the market mechanism (bargaining). The preference of the urban markets is due to several factors: prices at the urban market is relatively better than the village market as indicated by 26.9% of the interviewed sample; urban markets, on the other hand, offer a chance for selling anything that can be grown in the farms and obtaining the daily requisites as asserted by 17.5%. Moreover, the closeness of principal cities encourage the producers to sell their products at the urban markets as indicated by 13.5 per cent of the interviewed sample.

**Table (5.11 ): Marketing of gum in areas of farmers associations**

Village	N	Marketing Association Before			Why Market Town		Low floor price
		Village market	Town market	High price	Dual purposes	Town near	

Um Gzera	7	1.9	5.8	1.9	0	1.9	5.8
Merhbiba	15	15.4	7.7	0	0	0	23.1
Um siriha	20	21.2	9.6	7.7	5.8	1.9	26.9
Um Elshik	17	3.8	19.6	15.4	5.8	1.9	25
Suntshrg	6	1.9	5.8	1.9	3.8	3.8	5.8
Sunt Grb	5	1.9	3.8	0	1.9	3.8	3.8
Total 52	70	46.2	51.9	26.9	17.3	13.5	90.4

Irrespective of floor prices either at the village markets or urban markets, the farmer ascertain that the prices at the markets are low and they just gain a marginal revenue. This fact is supported by the majority of the interviewed sample (90.4%) The target group attributes the low prices to the high cost of gum production, particularly the cost of drinking water.

#### **5.6. Credit Accessibility before Gum Producers Associations**

The majority of the respondents (96.2%) claimed that there was no source providing loans before the establishment of the association because farmers have no fixed assets or formal title to the land which could serve as collateral. Table (5.12). While the rest of the respondents (3.8%) asserted the existence of credit, and all of them are from Um Siriha village. The main methods of credit in the study area is through *shyl* system which uses the eventual crop as collateral therefore it separates the farmers from their product.

The interviewed sample explored different reasons to the lack of credit accessibility. The main reason is the lack of sponsor body to offer loans with reasonable contract as claimed by 51.9% of the respondents. The second factor is the lack of fixed assets to be used as collateral.

**Table (5.12): Reasons behind lack of credit accessibility before the associations**

Village	N	Credit before	Why			
			No donors	Self satisfaction	Low Price	No legal position
Um Gzera	7	0	3.8	1.9		3.8
Merhbiba	15	0	9.6	1.9	3.8	19.2
Um siriha	20	3.8	15.4	0	7.7	30.8
Um Elshik	17	0	17.8	5.8	7.7	19.2
Suntshrg	6	0	3.8	5.8	3.8	3.8
Sunt Grb	5	0	1.9	1.9	3.8	3.8
Total 100	70	3.8	51.9	17.8	26.9	30.8

Moreover, uncertainty of satisfactory production due to the erratic nature of the rainfall coupled with the fluctuation of prices was mentioned by 26.9% of the respondents as factors behind the lack of loans. Some of well-to-do farmers (17.8%) mentioned that their financial potentiality allow them to perform the different activities without the need for loans.

### **5.7. Benefits of Associations as Viewed by the Farmers in the Study Area**

Since the establishment of the gum producers associations on 1992 up to date, many activities were applied by FNC staff on the area covered with associations within the gum belt project centres. Table (5.13) shows the perceptions of the stakeholders about the different activities.

**Table (5.13): Benefits of farmers associations**

Village	Produce seedlings	Extension services	Access to Credit	Collective marketing	Water & other services	Protect farmer	Reasonable price
Um Gzera	5.8	3.8	1.9	3.8	1.9	5.8	3.8
Merhbiba	17.3	17.3	23.1	9.6	15.4	11.5	19.2

Um siriha	25	23.1	32.7	19.2	26.9	28.8	30.8
Um Elshik	15.4	17.3	21.2	13.7	11.5	11.5	17.3
Suntshrg	1.9	3.8	1.9		3.8	1.9	3.8
Sunt Grb	1.9	3.8	1.9	1.9	1.9		3.8
Total	67.3	69.2	82.7	48.1	61.5	59.6	78.8

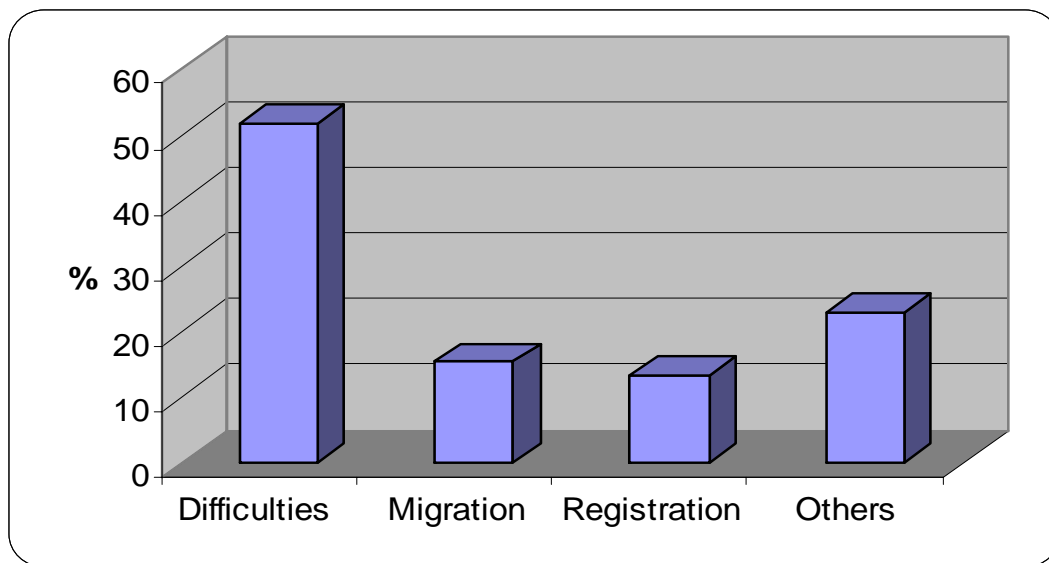
The main benefit from the establishment of the associations is provision of credit accessibility as claimed by 82.7% of the interviewed sample. Moreover, the establishment of the association abolished the role of peddlers, brokers and the shyl system beside the provision of reasonable and suitable prices as viewed by 78.8% of the respondents. Sixty-nine per cent of the respondents showed that the extension services provided by the extension staff (FNC) is one of the benefits that contributed to existence of the gum gardens. Moreover, through the philosophy of seedlings production at the village level, 67.3% of the respondents showed they gained enough knowledge on technical know-how of the different techniques and activities associated with gum production. Provision of water during times of tapping and picking through tankers is considered by 61.5% of the respondents as one of the benefits of the associations. In the past water shortage is one of the limiting factors confronting gum tapping and picking due to the high cost of hiring tankers for transporting drinking water. while 59.6% viewed the benefits of the association as the protection of the farmers against the shyl system and brokers. Social consolidation which is reflected in the collective marketing of the produce is viewed by 48.1% of the respondents as one of the benefits of the associations.

### **5.8. Difficulties Confronted the Establishment of Gum Associations**

During establishment of the associations some problems were raised in some of the associations. This fact is supported by 51.9% of the respondents. Migration of

the real owners of gum gardens to the principal cities was viewed by 15.4% of the respondents as a serious obstacle that confronted the establishment of gum producers associations. Bear in mind, one of the conditions of membership in association is the permanent residence of the real owner permanently or partially (during times of gum tapping and picking. 13.5% mentioned that the procedures of registration of the association is difficult because of the high cost of registration fees. While 22.7% of the respondents asserted that they have not met any constraints for the registration of their associations. (Fig. 5.3).

**Fig. (5. 3): Constraints confronted the establishment of farmers associations**



### **5.9. Institutions Indulged in Credit Accessibility**

after the establishment of the association different bodies showed their keenness to support the innovation of gum producers associations for the benefits of the local communities and the country as whole. In this sense the categories extended to include new stakeholders (secondary stakeholders) represented in the different institution which look for investment in gum arabic. The reason behind the intervention of the different institutions is due to the seriousness of the established associations. The main institution is the FNC as asserted by all the respondents. It

is logic to find that the FNC is the sponsor body because it is the most related sector to the activities of gum producers associations. It has the following functions: lay down the general policies for forests; propose law, which achieve the implementation of the approved policies; follow-up the implementation of the forests general policies; technically supervise all forests, at the country's level; disseminate awareness with respect to forests and trees; conduct researches and lay down the necessary plans; increase the reserved forest areas and intensify tree plantation; encourage the establishment of forests through provision of necessary inputs; develop the production of gum, especially Gum Arabic; and coordination with related sectors (Scoones, (1998).

Moreover, 23.1% of the interviewed sample declared that they received credit from Savanna Sudaneese Gum (SSG) and Khartoum Interprices Company, and 3.8% got credit from the Development Bank. The philosophy of the existence of other institutions is due to the fact that the loans provided by the FNC is not enough to cover the whole areas of associations. Therefore, and relying on certain conditions, the FNC select 2/3 of the respondents for the distribution of credit based on the more eligible members.

Repayment of the loan is done in terms of cash, gum or cash and gum as stated by (85.5%) of the interviewed sample. In case of the repayment in the form of gum, this usually made gum from 2<sup>nd</sup> and 3<sup>rd</sup> picking. The first picking is left for the farmer to meet his needs. The majority of the respondents (80.8%) stated that the amount of loans provided by the different bodies is enough to cover the costs of tapping and picking, and the loans are received in the right time without any delay, therefore, the farmers are not obliged to follow the shyl system. The rest of the respondents (19.2%) complained that the amount of loan is not enough. Probably those are farmers who possess large gum gardens. Generally, the credit acceccibility is governed by certain conditions. The majority of the respondent

showed that it depends on the area ready for tapping as stated by (98.1%) of the respondents. Beside the tapping area, the producer must commit to repay in time according to prespecified date agreed upon by the two sides (FNC and the farmer) as stated by (63.5%). Moreover, the farmer must be active and trustable as indicated by 57.7% and 46.2%, respectively.

#### **5.10. Hashab Stocking Density and Gum Tapping**

Due to the bush- fallow system practiced by the farmers within the project area for centuries, and according to the continuous increasing of the prices of cash crops, and declining price of gum arabic, most of the villagers cut their hashab trees to plant more sesame and karkadi, and leave a scattered numbers of trees in their farm. In the study area, the average number of trees per Mukhamas is more than 100 trees as asserted by (32.7%) of the respondents, and (44.2%) showed that they have an average numbers of trees/Mukhamas between 50 – 100 trees, while the rest (23.1%) have an average number of hashab trees are less than 50 trees/Mukhamas. Table (5.14). Therefore, the stocking density of hashab trees in the gum gardens is reasonably good. If the spacing between trees is 6m X 6 m, the stocking density of the trees is 116 trees/ feddan ( about 200 trees / mukhamas ).

According to the traditional Gum – bush cultivation cycle, 1/4<sup>th</sup> of the gum garden is retained fallow ( bare of trees ) for agricultural crops production.

**Table (5.14): Tapping of hashab trees in the areas of farmers associations**

Village	No of trees/ Mukhms %			Season of tapping %		Tools %		
	<50	50-100	> 100	Winter	Summer	Axe	Sunk i	Other

Um Gazera		3.8	3.8	3.8	7.7	7.7	3.8	
Merhbiba	1.9	15.4	5.8	23.1	15.4	23.1	9.6	1.9
Um Siriha	9.6	17.3	5.8	19.2	11.5	25	13.5	
Um Elshik	5.8	5.8	15.4	9.6	11.5	25	9.6	3.8
Sunt Sharg	3.8	1.9		5.8	1.9	0	5.8	
Sunt Graib	1.9		1.9	3.8	0	0	3.8	
Total 100	23.1	44.2	32.7	65	48.1	80.8	46.2	5.8

Most of the respondents (65%) tapping their hashab trees during winter time (October- November), while 48.1% tapp their hashab trees during Summer season (February – mid March). From the above finding it is clear that some farmers tend to tapp their hashab trees twice per year (summer and winter). The preference for winter tapping may be attributed to the fact that during winter the farmers have much leissure time and the tapping activity dosen't coincide with the agricultural season. For those who tapp at the two seasons, this may be attributed to the failure or low yield of winter tapping. The measures for tapping are simple and easily mastered. Only hand tools are used for tapping. Despite the great efforts exerted in dissimination of information regarding the use of sonki for tapping by the project of Restocking of Gumbelt, (80.8%) of the interviewed sample rely on the axe as the main tool for tapping compared to 46.2% use Sonki. This clearly shows that some respondents use both sonki and the axe. Five per cent stated that they use other local tools for tapping "Makmak".

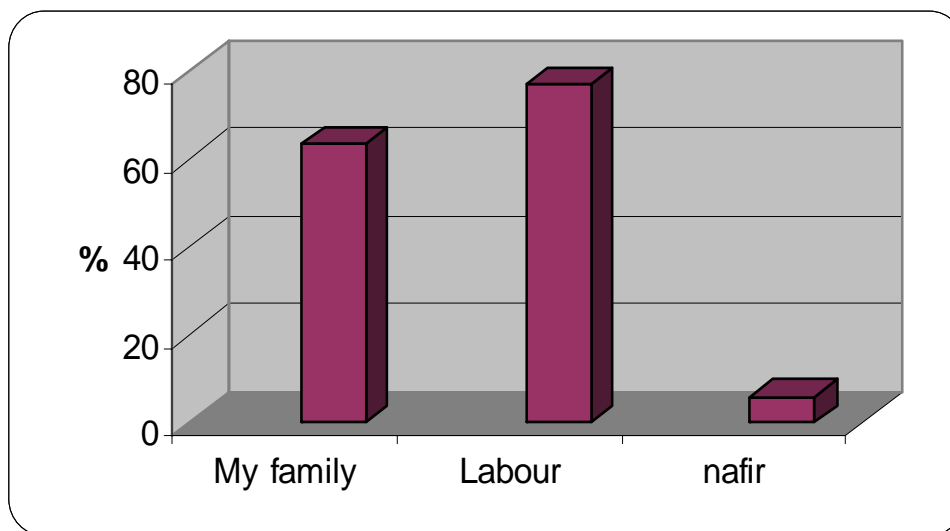
### **5.11. Labor Force and Cost of Tapping**

In the study area, the principal source of labor is the hired labors as claimed by 76.9% of the respondents followed by household members (63.5%), household (family labor). The small scale farmers cannot perform all activities by themselves relying on household member. The traditional method of mobilizing labor is by organizing a work party (nafir). Accordingly, 5.8% of the interviewed sample



claimed that they used work parties in tapping operation. The principal reason given for the decision to organize a work party is efficiency. Mutual help is another reason, signifying that some people cannot afford to hire labors. Traditional farmer workgroups of mutual assistance, *nafir*, seem to be declining in importance in the study area. The growing commercialization of production is given as the chief reason. Due to the low prices paid for agricultural produce, income from gardens is often insufficient to secure a living for household members. Given the simplicity of tools, increased productivity is rarely possible for all the farmers. This situation tempts young male members of the family to work as wage labors since people who possess huge landholdings can't perform all the activities of gum tapping and picking relying on their household members and mutual assistance. Other alternatives for income generation is limited, one strategy as a coping mechanism is migration to principal cities for sake of better job opportunities.

**Fig. (5. 4): Source of labor for gum tapping and picking**



The cost of tapping per Mukhamas is very high when including the time consumed by the family and their daily needs, but in terms of money when they hire labor, 63.5% said it costs more than SD 1700 per mukhamas, (SD 971.4/feddan). 19.2%

said the cost is ranging between SD 300 – 1000 per mukhamas, (SD 171.4 – 571.4/feddan). And 17.3% said the cost is ranging from SD 1400 -1600 per mukhamas. ( SD 800 – 914.3 / feddan).

The majority of the respondents (57.7%) asserted that the avarage cost of gum picking per Mukhamas is ranging between SD 400 – 1000, (SD 228.6 – 571.4/feddan ). While 23.1% stated that it is between SD 1100 – 1700 (SD 628.6 – 971.4/ feddan). At times of labor scarcity 9.6% of the respondents mentioned it might reach between SD 1800-2400 per mukhamas, (SD 1028.6 – 1371.4/ feddan). And some others (9.6%) stated it may reach between SD 2500- 3100 (SD 1428.6 – 1771.4/feddan).

**Table (5.15 ): Different costs of harvest**

Village	N	Cost of harvest "00" SD %				Cost of tapping "00" SD		
		4-10	11-17	18-24	25-31	3-10	14-16	>17
Um Gzera	7	21.2	5.8	1.9	0	1.9	0	5.8
Merhbiba	15	15.4		1.9	0	1.9	1.9	19.2
Um siriha	20	17.3	5.8	3.8	7.7	15.4	1.9	15.4
Um Elshik	17	0	5.8	1.9	1.9	0	3.8	23.1
Suntshrg	6	3.8	1.9	0	0	0	5.7	
Sunt Grb	5	0	3.8	0	0	0	3.8	
Total	70	57.7	23.1	9.6	9.6	19.2	17.3	63.5

The avarage income from gum produced during the last three years was ranging between SD 15000 – 45000 per mukhamas, (SD 8571.4 – 25714.3/ feddan ), as stated by 26.9% of the respondents, and more than 105300 SD per mukhamas, (SD 60171.4/ feddan), as stated by similar percentage of the respondents. While, 28.8% of the respondents claimed that their revenue for the last three years fall within the range of 45100 to 75100 SD per mukhamas, (SD 25771.4 – 42914.3/

feddan). And only 17.3% said had average income of 75200-105200 SD per mukhamas, (SD 42971.4 – 60114.3/ feddan).

**Table (5.16): Average income from gum interprise**

Village	N	Average income 3- years ago %			
		15000-45000	45100- 75100	75200-105200	>105300
Um Gazera	7	5.8	0	1.9	0
Merhbiba	15	1.9	11.5	3.8	5.8
Um Siriha	20	9.6	7.7	5.8	9.6
Um Elshik	17	9.6	5.8	3.8	7.7
Sunt Sharg	6	0	1.9	0	3.8
Sunt Graib	5	0	1.9	1.9	0
Total	70	26.9	28.8	17.3	26.9

Although all the farmers declared hashab trees exists in their gardens, only 69.2% of them mentioned that they tapped all the trees in their farms. The rest of the respondents (30.8%) mentioned different reasons which confront tapping of their hashab trees. These reasons are: the high cost of tapping as indicated by 28.8%, while 30.8% complaint from lack of credit accessibility. As mentioned earlier the loans provided by the FNC covers two third of the farmers.

**Table (5.17) after establishment of the associations**

Village	N	Reasons for not tapping all the hashab trees %				
		costive	No loan	Low gum price	No labour	Other
Um Gzera	7	5.8	5.8	1.9	1.9	1.9
Merhbiba	15	9.6	9.6	3.8	0	0
Um siriha	20	5.8	5.8	0	0	0
Um Elshik	17	7.7	9.6	1.9	0	3.8
Suntshrg	6	0	0	0	0	0
Sunt Grb	5	0	0	0	0	0
Total	70	28.8	30.8	7.7	1.9	5.8

Moreover, 7.7% showed that the current prices of gum is not encouraging to invest on gum. Labor scarcity also confront tapping of all trees as mentioned by 1.9% of the interviewed sample. Finally, 5.8% mentioned that the time of tapping coincides with agricultural crops harvest and in this case preference is giving to the crops. Under this situation, labor shortage acts as a serious constraint.

### 5.12. Marketing of Gum Produced in the Area of the Association

The average amount of gum produce per tree as described by 40% of the respondents falls within the range of 11-16 lb per tree, ( 1lb = 0.454 Kg. )while 36.5% showed that it falls between 5-10 lb per tree. The rest of the respondents ( 23.1%) stated that at favourable conditions the production of gum per tree may reach between 17- 22 lbs per tree. During data collection, the author recorded 35 lb per tree under 5-7 pickings per season from an ideal gum garden with spacing between trees is about 10 meters, no grazing, good rain, and no pests or fire attack.

As far as the marketing of gum is concerned, all the respondent (100%) stated that this procedure is undertaken by the village committee in the case the committee facilitates the credit to associations. Through this strategy the sustainability of the associations is guaranted since through the marketing the village committee ensure the repayments of loans in the right time. Moreover, all the respondents confirmed that the price offered by the association is always high compared to the village or market price.

**Table (5.18): Marketing and prices of gum arabic**

Village	N	Average production/ tree /lb			Production Mukh/ Kuntar	Marketing	Associ ation price
		5-10	11-16	17-22			
					1.5-2.5	associatio n	higher

Um Gazera	7	1.9	5.8	0	7.7	7.7	7.7
Merhbiba	15	13.5	5.8	3.8	23.1	23.1	23.1
Um Siriha	20	13.5	9.6	9.6	32.7	32.7	32.7
Um Elshik	17	7.7	15.4	3.8	26.9	26.9	26.9
Sunt Sharg	6	0	3.8	1.9	5.8	5.8	5.8
Sunt Graib	5	0	0	3.8	3.8	3.8	3.8
Total	70	36.5	40.4	23.1	100	100	100

### **5.13. The Role of the Associations in Rural Development**

The associations, and through the adoption of different activities contributed significantly to the development in the rural areas where the associations exist. The main contribution is represented in raising the standard of living of local inhabitants through the provision of credit accessibility. Provision of loans in the right time of picking and harvest eliminate the chance of following the shyl system and guarantee tapping of all trees which consequently reflected in high production and revenue. This fact is supported by 96.2% of the respondents. While 94.2% stated that the associations contributed significantly in the provision of public services either through establishment or rehabilitation of public service like water services. Consolidation of social relations among farmers is considered as a vital role of the association. Through collective marketing, and hosting and welcoming of different visitors farmers gain trust on each other. Moreover, the association contributed to the rehabilitation of the gumbelt in the study area through provision of seeds and seedlings, dissimulation of technical know-how and organization of local communities in contact groups for dissimulation of information. This fact is supported by 88.5% of the interviewed sample. The associations also adopt some activities like protection of gum garden through the adoption of the technique of firelines and encouragement of using the Sunki for tapping instead of Axe. Moreover, the money from the membership fees is used in many activities like rehabilitation and construction of schools and healthcare centres. Also the

associations trained their members on how to control locust biologically and mechanically by destroying locust's eggs.

#### **5.14. Bush-Fallow System**

Tiffen (1983) defines shifting cultivation as a technique for restoring soil fertility after a period of arable cultivation. It consists in relatively short periods of cultivations followed by relatively long periods of fallow. All the respondent (100%) stated that they practice agricultural rotation which is typical to the gum-bush cultivation cycle or a modification of the gum-bush cycle. The majority of the respondents ( 86.3%) showed that they cultivate crops with hashab for 3 to 6 years. After the age of 7 years the land is left to revert to bush-fallow as mentioned by 28.8% of the interviewed sample. Some respondents (34.6%) stated that the older gum trees are cut down with a view to killing the stumps, but younger trees and seedlings are pruned back closed to the ground so as to keep them alive throughout the 3-10 years of cultivation and the whole area is reverted to agricultural crops. The gum tree, *Acacia senegal* (hashab), regenerates freely on cultivated lands, and when a piece of land is left fallow after cultivation, a gum garden is formed (Jackson and Shawgi, 1950, Seifel Din, 1969).

SCF (1985) showed that the earlier rotational cultivation cycle has been modified due to the processing of facility in the oldest vegetable oil factory in Sudan, which was established in North Kordofan State in the 1940s, the more favorable prices and productivity relations of oil seeds, many farmers intensified their groundnuts and specially sesame production at the expense of their gum orchards.

**Table (5.19 ): Gum-bush cultivation cycle**

Village	N	Follow Rotation	Hashab+ crops	Hashab only	Crop only
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		cycle	3-6 year	7-20 year	3-10 year
Um Gazera	7	7.7	5.9	0	0
Merhbiba	15	23.1	21.6	5.8	5.8
Um Siriha	20	32.7	27.5	13.5	15.4
Um Elshik	17	26.9	21.6	7.7	7.7
Sunt Sharg	6	5.8	5.9	1.9	3.8
Sunt Graib	5	3.8	3.9	0	1.9
Total 100	70	100	86.3	28.8	34.6

Awouda (1973) showed that the sign of disturbance of this balanced system appeared many years ago, leading to serious degradation of soil fertility, soil erosion and desert creeping. The final effect was ecological, social and economic imbalances. The above table shows that the system of rotational cycle is still practiced in the study area, the only change is the shift from 3-5 years crop to 3-10 years (Seifel Din, 1978).

#### **5.15. Benefits of Hashab Trees other than Gum**

The ecological awareness of the local inhabitation in the study area is very high. This fact is represented in their knowledge of the benefits of hashab trees other than gum production. This knowledge is attributed to the effective extension unit within the project of rehabilitation of the gumbelt. The majority of the respondents (86.5%) stated that the hashab trees have the potentiality to increase soil fertility. This knowledge is acquainted through experience where farmers arrived to a point where they could compare agricultural productivity under hashab trees and in the absence of the hashab trees. In the study area, which is dominated by the hashab trees according to Harrison and Jackson (1958), hashab trees provide the local people with building poles for the local houses construction as stated by 94.2% of the interviewed sample. Bear in mind, reliance on hashab trees for building materials is not endangering the existence of the species since after the rotation the old hashab trees are felled to the ground for different purposes among which is the provision of building materials. Moreover, the tree species is the main source of

fuelwood and charcoal for the local inhabitants as indicated by 84.6% of the respondents.

**Table (5.20 ): Uses of hashab trees**

Village	N	Combact Desert	Soil fertility	Building poles	Fuel	Rain	Drugs
Um Gazera	7	7.7	3.8	5.8	5.8	0	0
Merhbiba	15	17.3	23.1	21.2	19.2	13.5	1.9
Um Siriha	20	26.9	28.8	30.8	23.1	11.5	7.7
Um Elshik	17	17.4	21.2	26.9	26.9	7.7	9.6
Sunt Sharg	6	5.8	5.8	5.8	5.8	1.9	
Sunt Graib	5	3.8	3.8	3.8	3.8	3.8	1.9
Total	70	78.8	86.5	94.2	84.6	38.5	21.2

While 78.8% of the respondents claimed that the hashab trees is capable of mitigating the negative consequences of desert encouragement. This is logical because the species is adapted to the local environment and capable to perpetuate itself in this harsh conditions through natural regeneration. Some of the local people (38.5%) believe that the gum gardens increase the rainfall. Hashab trees also have other uses like local medicine as mentioned by 21.2% of the respondents.

#### **5.16. Factors Jeopardizing Existence of Hashab Trees and Gum Production**

*Acacia senegal* is a tolerant and drought resistant species that grows under annual rainfall between 100 mm to 800 mm, mainly between 300-400 mm with a dry period of 8-11 months ( El Amin, 1990). Frequent drought cycles is the main endangering factor to the existence of the hashab tree as mentioned by 94.2% of the respondents. A similar percentage of the respondent mentioned overgrazing as the main menace to the regeneration of hashab trees.

**Table (5.21): Constraints confronting hashab trees in the study area**



Village	Drought	grazing	fire	Cash crop	Locust	Migration	Tapping skills
Um Gazera	7.7	7.7	3.8	3.8	5.8	1.9	1.9
Merhbiba	21.2	21.2	21.2	15.4	17.3	15.4	17.3
Um Siriha	30.8	30.8	26.9	23.1	25	13.5	25
Um Elshik	25	25	23.1	17.3	17.3	17.3	1.9
Sunt Sharg	5.8	5.8	5.8	1.9	1.9	1.9	17.3
Sunt Graib	3.8	3.8		1.9		3.8	3.8
Total 100	94.2	94.2	80.8	63.5	63.7	53.8	67.3

Fires set by nomades to obtain fresh fodder from the sprouts cause damage to hashab trees and hinder regeneration of the species as asserted by 80.8% of the interviewed sample. Lack of skillful labor for the tapping activity results in the death of hashab trees as claimed by 67.3%. in the study area tapping is done by old males and the young generations have no experience and not willing and interested to learn tapping. The seasonal swarms of locust affects the growth and production of gum exoduates as viewed by 63.7%, and 63.5% mentioned the low prices of the gum is not encouraging to invest in this field. Due to the low income from subsistent crops and the low prices of gum, the young males tend to migrate to the princial cities for sake of good job opportunites as mentioned by 53.8%. Gum arabic Belt Rehabilitation Report of September, 1989, identified the main factors affecting gum production which were grouped into four main headings: physical factors (include soils, topography, and climate), biotic (man, animals, locust, and insects), institutional (marketing, transport, water, research, extension, and native adminisration), and socio-economic (incomes, migration, and agricultural expansion).

### **5.17. Management of the Associations**

In order to guarantee the success and sustainability of the association and to consider them as a successful model to be replicated in other areas of similar conditions, there should be a sound managerial body to cater for the different responsibilities and duties of the association. The objectives behind the

establishment of the association will not be achieved in the absence of active village committee to run the activity. In the study area as indicated by all the respondents, the managerial aspects of the association is done by an elected committee. the numbers of the members of the associations differ from one site to another. generally the number of the committee varies between 6-11 persons three of them are elected as a running committee (Chairman, Secretary, and Treasurer) and subjected to change according to situations.

The general perception of the interviewed sample towards the effectiveness of the village committee is good except 3.8% of the sample (all from Um El sheikh village) mentioned that the efficiency of the village committee is low coupled with many defects.

**Table (5.22): Administrative body of the farmers associations**

Village	N	Association management %		
		Committee	Election	Management defect
Um Gazera	7	7.7	7.7	0
Mrehbiba	15	23.1	23.1	0
Um Sreha	20	32.7	32.7	0
Um El sheikh	17	26.9	26.94	3.8
Sunt Sarg	6	5.8	5.8	0
Sunt GARB	5	3.8	3.8	0
TOTAL	70	100	100	3.8

### **5.18. Proposals for Development of the Association**

To promote the association activities and increase its benefits among members, 61.5% mentioned that motivations and incentives enhance and encourage members to participate in the different activities of the associations. Other proposals for the development of the activity includes: membership must be expanded (48.1%), many services must be introduced with integration of other institutions e.g. Health, Education, Water Corporation Department, etc., facilitate

credit for tapping and marketing, establishment of necessary infrastructure (stores and office for the committee) as stated by (46.24%) of the respondents. For the improvement of the activity, each association must employ field extension agent (40.4%), while some respondents (38.5%), suggested the establishment of a private company to tackle the different issues of gum production and marketing.

**Table (5.23): Suggestions for the improvement of farmers association**

Village	Increase member	incentives	Extension Agent	Service and infrastructure	company	Credit facilities
Um Gazera	0	3.8	7.7	7.7	3.8	3.8
Mrehbiba	17.3	17.3	5.8	9.6	3.8	5.8
Um Sreha	17.3	26.9	9.6	19.2	21.2	25
Um El sheikh	9.6	9.6	11.5	7.7	5.8	9.6
Sunt Sarg	1.9	1.9	1.9	1.9	1.9	1.9
Sunt GARB	1.9	1.9	3.8	0	1.9	
Total	48.1	61.5	40.4	46.2	38.5	46.24

To apply the above proposals, 61.5% said they must have to contact FNC for more co-ordination and facilitations, while 55.8% expressed the need of integrating with other agencies and institutions are very important.

**Table (5.24): Conditions for the fulfilment of the suggested solutions**

Village	N	Encourage people	development	Water service	Integration	Contact FNC
Um Gazera	7	1.9	1.9	0	1.9	7.7
Mrehbiba	15	17.3	15.4	13.5	15.4	17.3
Um Sreha	20	15.4	13.5	9.6	23.1	13.5
Um El sheikh	17	0	3.8	0	9.6	15.4
Sunt Sarg	6	0	0	0	1.9	3.8
Sunt GARB	5	0	0	0	3.8	3.8
Total 100	70	34.6	34.6	23.1	55.8	61.5

Some respondents (34.6%) call for encouraging the members to contribute to the development of the area, 23.1% asked for providing water to members for settlement to participate in applying that proposals.

## **5.19. Gum Arbic Production in Areas of no Farmer's Associations**

### **5.19.1. Introduction**

As mentioned earlier the innovation of Gum production farmers association is established in few sites and not covering the whole gum belt zone. Even in North Kordofan state some localities did not witness the formulation of such body. In this research two localities, where there is no farmers' associations established, were selected to explore their opinions about the associations and their potentiality and willingness to form farmers association at their localities. The two localities are Um Ruwaba and Bara. Two villages were selected from each locality and fifteen respondents were selected to represent each village.

### **5.19.2. Areas of Hashab Gardens and Areas Covered by Hashab**

The total areas of the agricultural lands is explored in Table (5.25). Fifty per cent of the interviewed sample possess agricultural land of an area greater than 31 mukhamas. The rest of the respondents have agricultural lands varies between 21-30 mukhamas as stated by 30% and between 11-20 mukhamas for 20% of the respondents. From these findings it is clear that the main source of income to the local people is farm practices. The agricultural land in these sites are locally known as gum gardens due to the fact that the farmers deliberately manage to retain hashab trees in their farms and practice agricultural activities between the trees. The arrangement of the trees in the farm varies considerably between farmer to another and between sites. Generally the different trees arrangements are: parksland (where the hashab trees are scattered randomly in the entire garden) windbreaks and hedgerows.

**Table (5.25): Areas of agricultural lands in the study area**

Village	N	<i>Total area</i>		
		11-20	21-30	>31
Tayba	8	3.3	3.3	13.3

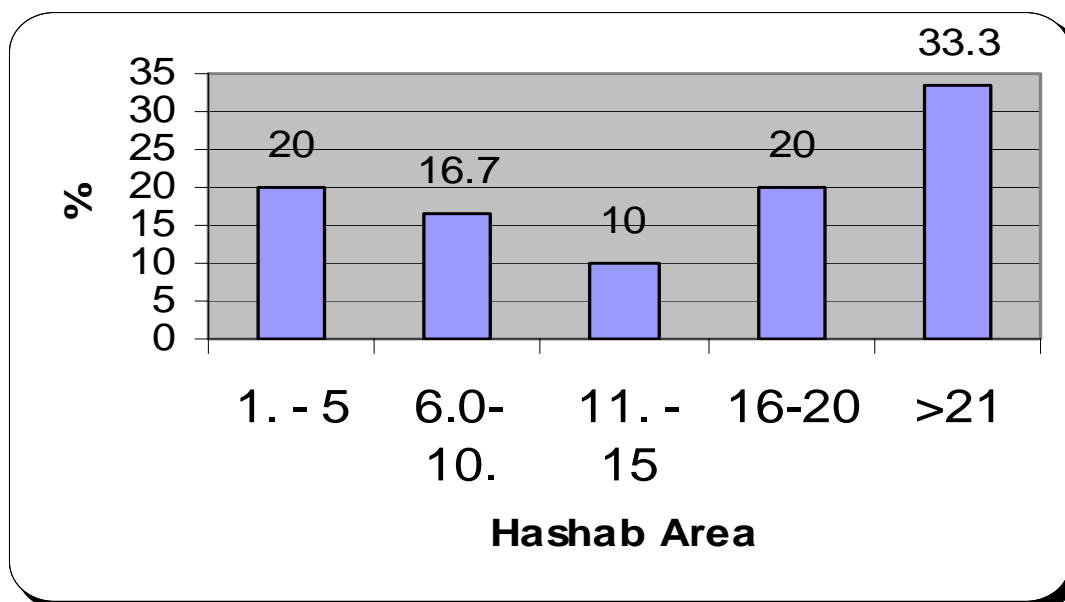
Fangoga	7	10	10	<i>10</i>
Shirim	6	0	6.7	<i>16.7</i>
Kiriedim	9	6.7	10	<i>10</i>
Total	30	20	30	50

Figure ( 5.5 ) shows the areas occupied by hashab trees in the sites where there is no farmer associations.

It seems, still the hashab tree gain considerable weight in the traditional farming system in the areas of no gum production farmers association. This reflects the beliefs of the farmers on the potentiality of the tree as a contingency asset, where the tree is considered as a source of income during times of no alternatives for income generation in the rural areas of the gum belt. All the respondents claimed that they still retain the hashab trees in their farms despite the tremendous changes in the traditional gum-bush cultivation cycle where 33.3% of the respondents claimed that the areas covered by hashab trees is greater than 21 mukhamas. Twenty per cent asserted that the hashab trees cover between 16 – 20 mukhamas and 10% mentioned that the tree utilize between 11 – 15 mukhamas.

The rest of the respondents (36.7%) have few hashab trees in their farms where 20% of the respondents mentioned that the hashab trees cover between 1 -5 mukhamas and 16.7% mentioned between 6 -10 mukhamas.

**Fig. (5. 5): Areas of farms covered by hashab trees**



### 5.19.3. Tapping of Hashab Trees in Areas of no Association

The situation of hashab tapping and picking in the areas of no association is similar to all sites within the gum belt where there is no association. Farmers have become reluctant to tap their trees for different reasons. All these reasons fall under the umbrella of gum marketing policies. The high fluctuation of the prices and the greediness of the mediators, peddlers and the gum company confronted a serious obstacle for hashab tapping. In the study area only 30% of the respondents showed that they tap their entire gum gardens. The rest of the respondents (70%), the majority, asserted that they do not tap the entire gum gardens. Small parcels are tapped to provide income to meet the daily requirements during times of no alternative source of income. Farmers follow this strategy in order to save their energy and time backed by their knowledge of low prices of gum Arabic. Different factors were mentioned by the respondents that restrict them from tapping the whole gum garden (Table (5.26)).

**Table (5.26): Factors confonting gum tapping in areas of no associations**

Village	N	Whole area	Factors influencing gum tapping
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			high Cost	Low price	No labour
Tayba	8	6.7	13.3	10	0
Fangoga	7	13.3	16.7	6.7	0
Shirim	6	6.7	16.7	13.3	6.7
Kiriedim	9	3.3	23.3	16.7	10
<i>Total</i>	30	30	71	46.7	16.7

The majority of the respondents (71%) mentioned that the high cost of gum tapping is the main reason confronting tapping of the entire gum garden. The study area is very harsh with erratic nature of rainfall and the farmers all the time have nagging doubts about the rains next season. Moreover, the study area suffer from the affordability of drinking water which represent the headache to the farmers. Gum tapping necessitates the establishment of a temporary camps for labors. Water is transported from a long distance (usually small water station or pumps). The cost of provision of drinking water is the main cost besides the wages of labor. The second main factor is the low and fluctuating nature of the gum prices as mentioned by 46.7% of the respondents. Farmers are hesitant to expire intensive efforts on gum tapping and picking and face by low prices of the gum Arabic. Lack of skillful Labors was mentioned by 16.7% of the respondents. All the respondents of this group are from Shirim and Kiriedim villages (Bara locality). This shows that there is no problem regarding labor availability in Um Ruwaba locality (Tayba and Fangoga villages).

#### **5.19.4. Information about Farmer's Associations**

Despite the non existence of farmers association in some sites, all the respondents of the villages selected to represent the sites of no farmers associations confirmed that they have enough knowledge about farmers associations in other sites (Table (5.27)). Half of the respondents (50%) declared that they come to know about the associations from the television and radio. While 43.3% (all from Um Ruwaba locality) asserted that they become knowledgeable about the farmers associations

through their contacts with near villages where farmers associations already established. Some respondents (36.7%) declared that the FNC extension agents informed them about the farmers associations and their potential roles in enhancing the marketing channels and stabilizing of gum prices.

**Table (5.27): Information about farmer's association**

Village	No	Association knowledge	Association/ Source of information			
			TV & radio	Near villages	FNC extensionist	Other
Tayba	8	20	10	13.3	6.7	0
Fangoga	7	30	10	30	3.3	0
Shirim	6	23.3	13.3	0	10	10
Kiriedim	9	26.7	16.7	0	16.7	3.3
<i>Total</i>	30	100	50	43.3	36.7	13.3

Some respondents mentioned other channels through which they become knowledgeable about the farmers associations.

Respondents were asked to explore exactly what they know about the farmers associations. Table (5.28 ) furnishes the knowledge of the farmers in areas without farmers associations about the associations established in other sites.

The majority of the respondents (93.3%) ascertained that they were informed that the association provides tremendous services to the farmers in terms of facilitation of marketing of gum and nullifying the role of mediators, brokers and peddlers beside ambush of the shyl system. In the same line 46.7% of the respondents mentioned that the association has led to the sharp increase in the gum prices in areas where farmers associations exist. Seventy per cent of the interviewed sample claimed that they witnessed the movement of development gear in terms of community development in areas which adopted farmers associations. It is worth mentioning that in the sites where farmers association exists, some parcels of gum purchase is assigned and devoted for rural development activities like



rehabilitation of school and water stations. While 60% mentioned that they knew through the formation of farmers associations there is a possibility of credit accessibility. The most important point was mentioned by 46.7% of the respondents dealing with the protection of the simple farmers by the gum company and traders.

**Table (5.28): Knowledge of farmers in areas without association about the farmers associations**

Village	N	Association knowledge				
		Service s	Credit	Community development.	Increase prices	Protect far me r
Tayba	8	16.7	13.3	16.7	10	16.7
Fangoga	7	30	16.7	13.3	30	10
Shirim	6	20	16.7	23.3	16.7	10
Kiriedim	9	6.7	13.3	16.7	20	10
<i>Total</i>	30	93.3	60	70	76.7	46.7

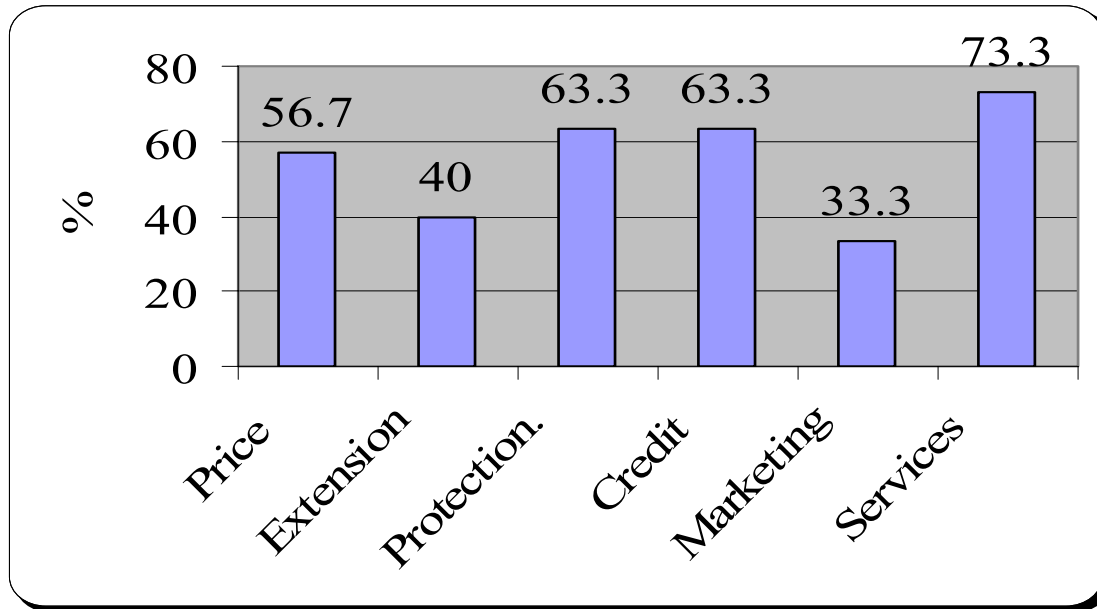
From the above findings it is clear that the farmers in areas without farmers associations appreciate the role of the association in organizing the local communities and aware about the expected benefits their society would achieve through the adoption of the innovation of farmers association.

#### **5.19.5. Objectives and Steps of Establishment of Farmer's Association**

The view of the respondents in areas without farmers associations about the objectives of the farmers association do not differ from what they know about the farmers association whether from the mass media or directly from their

observations and FNC extensionists. Figure (5.6) illustrates the views of the respondents about the objectives of the farmers associations.

**Fig. (5.6): Objectives of farmers association as viewed by farmers in areas without associations**



provision of services to the local farmers and to the local area was suggested by 73.3% of the respondents, while 63.3% assured that the main objective of the associations is the protection of the farmers against the exploitation by traders and gum company. A similar per cent of respondents (63.3%) believe that the sole objective of the association is to facilitate credit accessibility. Forty per cent of the interviewed sample mentioned the extension service as the objective of the farmers association, while 56.7% believe the objective behind the establishment is to deal with the fluctuating pattern of gum prices. Some respondents (33.3%) believe that the objective is to develop a sound marketing mechanism.

## **CHAPTER VI**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **6.1. Conclusions**

- The establishment of the farmers associations was started in the different sites in the period between 1992-1996 which coincides with the last phase of restocking of gum belt project. This indicates the ability of the project in sustaining the activity and disseminating the innovation even after the phase out of the project.
- The main conditions for the membership of the farmers associations are; tenure right of the farms, commitment to all instructions and guidance provided by the association, residence in the project area or at least during production period. Other criteria of selection of members include the member must be engaged with production of gum, paying his membership fees, and honest in his work and repayment of the credit.
- Although the adoption of the innovation of the associations in the study area is high, still a considerable proportion of gum producers were not recruited or encouraged to join the associations.
- The majority of the committee members were subjected to training session. The gum belt project was the main body responsible for training of the committee members, other institutions also contributed in training sessions like IFAD project. The main fields of training were: meeting management, filing system and book-keeping, accounting procedures, tapping techniques and ideal gum harvesting.
- FNC and Khartoum Processing Company (KPC) are the main sources for credit in the study area. It worth mentioning that this credit is not continuous and sporadic, moreover, it is not distributed systematically across the study area. Before the establishment of the farmer's associations, there was no source for

providing loans because farmers have no fixed assets or formal title to the land which could serve as collateral.

- The stakeholders of farmers associations encompasses gender issue, with the dominance of males over females. As far as age group is concerned, the majority of the members of farmer's associations are youth respondents. This indicates the absence of migration which is a common phenomena in the past where the young youth tend to migrate to the principal cities for better job opportunities and income generation.
- The study area is characterized by big family sizes which is considered important to safeguard against labor shortage where ideally, a man and his wife and their unmarried children make up a task force for agricultural purposes. This is the case in nuclear families. In the case of polygamy, each wife and unmarried children become economic units by themselves.
- The findings of this research revealed that the areas covered by hashab trees in the agricultural lands of the majority of the interviewed sample falls between 1-22 mukhamas. This clearly shows the sharp decline of areas assigned for hashab trees which in the past represents  $\frac{3}{4}$ <sup>th</sup> of the farm.
- In the study area, the state is the real owner of land, trees grown on this land are also considered state property. From interviewing staff in the Restocking of Gum Belt Project, they reported that at the beginning of the project, farmers in most villages in the project areas asked for letters from officials to ensure that the trees they were going to plant would be theirs.
- Gum production represents a source of income generation to the farmers in the study area. Some farmers mentioned two factors which confront them tapping their hashab trees, namely; the high cost of tapping and the low price of gum. The FNC represents the main source of seedlings and some farmers rely on other sources for the provision of seedlings, mainly village nurseries.

- After the establishment of the association there is an increase of areas covered by hashab trees. The areas restocked after the establishment of the association increase in the range of 1-10 mukhamas.
- There are two types of market where gum is sold: village markets and urban markets. Village markets are operated on certain days of the week (once or twice a week), and transactions take place directly between producers and consumers. Prices differ from one market to the other and on different days in the same market. The preference of the urban markets is due to several factors: prices at the urban market is relatively better than the village market, on the other hand, offer a chance for selling anything that can be grown in the farms and obtaining the daily requisites and the close distance of principal cities encourage the producers to sell their products at the urban markets.
- The main role of the farmers associations is provision of credit accessibility, abolishment of the role of peddlers, brokers and the shyl system beside the provision of reasonable and suitable prices for gum arabic.
- The extension service provided by the extension officers from FNC is one of the factors that contributed to existence of the gum gardens. Moreover, through the philosophy of seedlings production at the village level the farmers gained enough knowledge on technical know-how of the different treatments and activities associated with gum production
- The rate of migration, procedures of registration of the association were the main obstacles confronted the establishment of the farmers associations.
- The Stocking density of hashab tree was highly influenced by the expansion of agriculture at the expense of hashab tree due to continuous rise of the prices of the agricultural crops. Even for those who retain considerable number of trees in their agricultural land they were not encouraged to tap their gardens due to the relative low prices of gum arabic.

- The principal source of labor for gum tapping and picking is the hired labors, household members and work party (*nafir*). The principal reason given for the decision to organize a work party is efficiency. Mutual help is another reason, signifying that some people cannot afford to hire labors. Traditional farmer workgroups of mutual assistance, *nafir*, seem to be declining in importance in the study area. The growing commercialization of production is given as the chief reason.
- the average amount of gum produced per tree as described by the majority of the respondents falls within the range of 11-16 lb per tree. As far as the marketing of gum is concerned, the procedure of marketing is undertaken by the village committee in the case the committee facilitate the credit to the associations. Through this strategy the sustainability of the associations is guaranteed since through the marketing the village committee ensure the repayments of loans in the right time.
- The associations, and through the adoption of different activities contributed significantly to the development in the rural areas where the associations exist. The main contribution is represented in raising the standard of living of local inhabitants through the provision of credit accessibility, provision of loans in the right time of picking and harvest, provision of public services either through establishment of rehabilitation of public service like water services and consolidation of social relations among farmers.
- The main Factors jeopardizing existence of hashab trees and gum production are frequent drought cycles, overgrazing, fires set by nomades, lack of skillful labor for the tapping activity, the seasonal swarms of locust and the low prices of the gum.
- Farmers in areas without associations are aware about the role of the associations in raising the standard of living and its contribution to the development of the study area.

## **6.2. Recommendation**

- Introduction of incentives, motivations and extension service would highly encourage the farmers to manage their gum gardens for gum production. The FNC should investigate the suitable means for motivating the farmers to tap their trees.
- Provision of public services, particularly drinkable water, will help in the process of gum tapping and picking since the main cost of gum production is the cost of provision of drinking water to the labors.
- The FNC has now a successfully tested model that should be adopt and utlize and mange to expanded to other similar areas.

## REFERENCES

**ABARE Research Report. 1995.** Australian Bureau of Agricultural and Resource Economics, Canberra. 1995.

**Abdel Nour, H. O & Abdel Majid, T. 1997.** Human activities through 20<sup>th</sup> century and its effects on the forests of Sudan. FNC. Khartoum.

**Akumu, G. 1997.** Can GEF finances be accessed by NGOs working on desertification issues? Impact, Newsletter of the Climate Network. Africa. No. 21, Kenya.

**Astorga, L. (1990).** Training in participatory forestry In: D'Arcy D. and Heikki G. and Varpu V. (ed) planning and management of participatory forestry projects. Vol. (1). 1992. FTP, Helsinki.

**Awouda, E. H. M. 1974.** Gum Arabic it's present and future. Gum arabic corporation, Khartoum, Sudan Government Press.

**Awouda, E .H. M. 1973.** Social and economics problems of the gum arabic industry. Oxford University Press.

**Awuor, B. 1997.** Climate change and desertification linkages. Impact, Newsletter of the Climate Network Africa. No.21, Kenya.

**Badi, K. H. 1989.** The Natural Forests. In: Ahmed El Houry and Abdelaziz Mohamed Saeed Bayoumi (ed.). The Forests of the Sudan. Khartoum.

**Blunt, H. S. (1926)** Gum arabic with especial references to its production in the Sudan. Oxford University press.

**Born, M. 1965.** Zentral Kordofan, Marburg. Germany.

**Burchinal, Lee S. 1986** Lecture Notes and Steps in Conducting a Survey. Presented at the 2<sup>nd</sup> annual forestry extension workshop on the Methodologies and Techniques in Conducting forestry extension

**Carney D (1998)** Sustainable Rural Livelihoods. What Contribution Can We Make? DFID,

**Chamber, R. 1986.** Rural Development putting the last first. Longman. Hong kong.



**Coughlan, K. (1996).** Assessing the sustainability of cropping systems in Pacificland countries: Africa. No. 21, Kenya.

**DECARP. 1976.** Sudan's Desert Encroachment Control and Rehabilitation Program. Khartoum.

**EL AMIN, H. M. 1990** Trees and Shrubs of the Sudan, Ithaca press, Biddles Ltd, Guildford and Kings Lynn, England.  
El Hadi, (1984)

**El Mahdi,E. Satti and Des Mahony. 1990.** Forestry extension in Sudan a review of strategy. Fuelwood development for energy in Sudan. Khartoum.

**El sammani, M. O. 1985a.** Kordofan Resource Inventory. IES–Khartoum.

**El sammani, M. O. 1985b.** Kordofan Rehabilitation Development Strategy, VOL.1, IES & Government of Kordofan Region. Khartoum.

**Elamin, H.M. (1990).** Trees and shrubs of the Sudan. Ithaca Press, Exeter

**FAO (1985).** Tree Growing by Rural People. Forestry Paper no. 456, Rome.

**FAO. 1985.** Monitoring and Evaluation of Participatory Forestry Projects. FAO forestry paper (60), Rome.

**FAO. 1986.** Tree growing by rural people. FAO Forestry Paper No. 64 Forestry and Food Security, Rome.

**FAO. (1996).** Use of farm-level information in policy making and planning for sustainable.

**Fenton, R. T. 1989.** Directory of Forestry Activities by Overseas Aid Agencies.

### **Fuelwood Development for Energy in Sudan, Khartoum, Sudan**

**FNC. 1998.** NFI for the Sudan. Ministry of Agriculture and Forestry Khartoum, the Sudan and Food and Agriculture Organization of the United Nations.

**Forest Products Consumption Survey in the Sudan (1995).** Forest National Corporation, FAO. /GCP/SUD/047/Net. Khartoum.

**Fourth population census of the Sudan. (1993).** Advance sample tabulations Northern States. Department of statistics, census office. Khartoum 1994. **(Ministry of Finance and Economics, 1996 –Sudan)**

**Garforth, C. 1982.** Reaching the rural poor: A review of extension strategies and methods. In: G. E. Jones and M. J. Rolls (ed.). Progress in Rural Extension and Community Development. Vol. (1). John Wiley and sons Ltd. New York.

**Gasimelseed, T. Osama, (2000).** Prospects of Growing Acacia Senegal (L) Wild in Small Holdings, North Kordofan Area, ((M.Sc. thesis)

**Gomez, A.A., Kelly, D.E., Syers, J.K. and K.J. Coughlan (1996)** Measuring sustainability of Agricultural Systems at the Farm Level. Methods for Assessing Soil Quality, SSSA Special

**Gray, Deborah and Lang, Mahlon G. 1995.** Starting a Co-operative for Hardwoods and Special Forest Products. California Department of Forestry and Fire Protection and U.S. Department of Commerce, Economic Development Administration. September 1995.

**Harison, N. M. and Jackson, J. K;** Ecological classification of the Sudan, Bulletin of the Forestry Department, Khartoum, no. 2, **1958**

**Henderson, Ross and Leech, Mark. 1994.** Timber Growers Co-operatives, the Tasmanian Experience. Faces of Farm Forestry, AFG Conference. Australian Forest Growers. 1994.

**[http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/003/W5547E/W5547E07.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/W5547E/W5547E07.htm)**

**<http://www.nemw.org/forestecon.pdf>**

**[http://www.safnet.org/archive/0903\\_interview.cfmview.cfm](http://www.safnet.org/archive/0903_interview.cfmview.cfm)**

**Hunting Technical Service. 1977.** Agricultural development in the Jebel Mara area, Annex IV: Agriculture. Borehamwood.

**Keyworth, Peter. 1994.** A Case Study of Successful Co-operative Marketing of Forest Products in South Africa. Faces of Farm Forestry, AFG Conference. Australian Forest Growers. 1994.

**Rudolf Mascher**, Die Zusammenschlusse im kleinen Waldbesitz Nordwestdeutschlands, ihre rechtliche und forstrechtliche Gestaltung. Bremen-Horn, Walter Dom Verlag, 1954

**Ministry of Agriculture and Forests. 1996.** Forests National Corporation. Information Note, third edition. Khartoum.

**Ministry of Finance and Economics. 1996.** Fourth Population Census of Sudan 1993. Analytical Report. Central Bureau of statistics. Department of statistics, Khartoum.

**Otinda, P. A. 1997.** Desertification: can it be combated?. Impact, Newsletter of the Climate Network Africa. No.21, Kenya.

**Parnell, Edgar. 1995.** Reinventing the Co-operative. Plunkett Foundation. 1995. programme in Sudan.

**Save the Children Federation. (SCF, 1988)** Baseline Report. Um Rawaba District, North Kordofan Sudan.

**Scoones I, 1998** Sustainable Rural Livelihoods: A Framework for analysis. Working Paper 72, Sustainable Livelihoods Programme, IDS, Sussex. Washington

**Seif el Din, A. G. ( May 1975)** The Future of Gum Arabic in Sudan, Sudan International, Khartoum,.

**Seif el Din, A. G. (1978).** The Gum Hashab and Land Tenure in Western Sudan. Sudan Silva, no 23 vol III, Khartoum, Sudan.

**Seif el Din, A. G. 1982.** The study of the formation of the gum arabic in relation to the anatomy of *Acacia senegal* (1) wild. Sudan Silva, No. 24 Vol. IV.

**Sen, D. and P. K. Das. 1987.** The management of people's participation in community forestry. Some issues. Social Forestry Network. Paper 4D.

**Sharawi, H. A. (1986)** *Acacia Senegal* in the Western Sudan : A cost benefit analysis. University College of North Wales, Bangor. 186 p (M.Sc. thesis)

**Shepherd, G. 1990.** Participation the necessity. . In: D'Arcy D. and Heikki G. and Varpu V. (ed.). Planning and Management of Participatory Forestry Projects. Vol. (2). 1992. FTP, Helsinki.

**Simon, Donald M. and Scoville, Orlin J. Forestry Co-operatives. 1979.** Organisation and Performance. United States Department of Agriculture. Agriculture Co-operation Series Research Report No.25. 1979.

**UNSO. 1989.** Project document of the Restocking of the Gum Belt for Desertification Control, Phase I II.

**UNSO/SUD/48/X01 (1989).** Project document of the Restocking of the Gum Belt for Desertification Control, Phase III.

**Uphoff, Norman. 1983** .Forests, trees and people, Newsletter No. 22”

**Wiersum, K. F. 1984.** Developing strategies for social forestry: conceptual approach; Dept. of Forestry, Agric. University-Wageningen, Netherlands.

**Wilkins, G. C. 1978.** Integrating forest and small scale farm systems In middle America. Forest ecol. And manage. 1 (1).

**Wilson, Suzanne M., Whitham, Jeremy A.H., Bhati, U.N., Horvath, Diana,**

Tran, annick D. **1994.** Trees on Farms. Survey of trees on Australian farms: 94.

**World Bank. 1986. Sudan Forestry Sector Review.** Report No. 5911 Sudan.

**APPENDIX I**  
**Farmers Questionnaire**  
**For Association Committees**

**2. General Information**

- Locality
- Rural Council
- Village
- Name of the association
- Date of Interview

**2- Name**

**3- Occupation ( chair man ), ( secretary), ( treasurer )**

**4- Age**

**5- Education level**

**6- population in the village**

**7- No. of household**

**8- Date of establishment of the association**

**9- Date of your election**

**10. do you have any kind of training? When and where?**

**11. who is sponsoring your training? And in what field?**

**12. What are the membership criteria ?**

**13. What are the total members when the association was established?**

**14. Total members for last 5 years?**

**15. are there any farmers in the village not engaged in the associations?**

**If yes, why and how many?**

**16. Did your association receive any credit for tapping  
or marketing?**

- 17. If yes, from where?**
- 18. What are the steps you follow to have credit or loan?**
- 19. What are the main criteria of distribution of credit?**
- 20. How do you retrieve credit from members?**
- 21. How do you treat members who fail to repay in time?**
- 22. are there any difficulties you faced during repayment?**
- 23. If yes, determine?**
- 24. What do you suggest to promote repayment?**
- 25. What are your proposals for getting loans?**
- 26. What are the means of communication between the association and the FNC? And how?**

- exchange visits, - we only contact them, - only FNC staff visits us,
- by Field extension agent. – by sending representatives, - letters, or by telephone

**APPENDIX II**  
**Farmers Questionnaire**  
**For Associations Members**

**1. Introduction**

**2. General Information**

- Locality
- Rural Council
- Village
- Date of Interview

**3. Social Characteristics for the Farmers within the Study area**

- Sex (a) Male (b) Female
- Age
- Education Level : illiterate, Khatwa, primary, sec., un.
- Occupation : farmer, merchant, teacher, others
- Marital Status: single, married, divorced, widow
- Family Size
- Total Area / Mukhamas
- Total Hashab Area
- Tapped all Area? Yes No
- If No (why) : tapping costly , no labor, low price, others (specify)

**4. Situation Before Establishment of the Associations**

- You continue planting after termination of the project?
  - Yes
  - No

- If yes from where?      Seedling from FNC,      village nursery,  
seeds.

**5. Marketing before Establishment of the Association:**

- single      - collective marketing

**6. Place of Marketing and why?**

- village merchant      - village market      - near market or, town

**7. The Price you have compared with floor price:**

- Same      - Low      - More

**8. Credit Accessabilty and Loans**

- Yes      - No

**9. If yes from where?**

- Banks      - Company      - FNC – Village merchant (Shyl) – Others  
specify?

**10. Who initiated the idea of establishing associations?**

- FNC      - Farmers from village      - from others(specify)

**11. Describe the steps of the establishment of association**

**12. What are the benefits from the establishment of associations**

**13. What type of constraints you faced during the establishment**

**14. Did your association receive any credit or loan after**

establishment?      Yes (   )      No (   )

**15. If yes, from where?**

**16. How do you repay ?      In kind (   )      Cash (   )**

**17. The amount of money you received is it enough ?**

**18. Do you benefit from credit? if yes, to what extent?**

**19. What are the problems confronting the distribution of the credit?**

1- -----      2- -----



3- ----- 4- -----

**20. Your hashab area/ mukhamas when you became association member?**

Less than 10, ( ), 11-21 ( ), 22-32 ( ), more than 33 ( )

**21. Did you increase your hashab area?**

Yes ( ) No ( )

**22- If yes how?**

Seedlings ( ) Seeds ( )

**23. What is the source of seedlings/seeds**

Seedling from FNC ( ), seeds from FNC ( ), home nursery ( ), village nursery ( )

seeds from my farm ( ), purchase seeds ( ).

**24. Your total area (per mukhamas) rehabilitated -----**

**25. Is your area matured and can be tapped?**

Yes ( ) No ( )

**26. Hashab Tapping**

- No. of trees/ mukhamas

Less than 50 ( ), less than 100 ( ), more than 100 ( )

**27. Season of tapping**

Winter tapping ( ), summer tapping ( ), both ( )

**28. Tools used for tapping**

Axe ( ), Sunki ( ), others ( specify )-----

**29. Who taps with you?**

Alone ( ), with my family ( ), rent labor ( ), nafir ( )

**30. Cost of tapping per mukhamas SD.-----**

**31. Did you tapp all trees ?**

yes ( ) No ( ) why?

**32. Gum harvesting**

- 1- cost of collections SD.-----
- 2- Average production of a tree lb -----
- 3- Average production per mukhamas ----- (kuntar)

**33- Marketing of gum**

**1- To whom you sell your gum?**

To association ( ), to village merchant ( ), middlemen ( ), near market

**34. Is the price of the association differed when compared with others?**

More ( ), less ( ), no difference ( )

**35. Is the floor price satisfying ?**

yes ( ), No ( )

**36. your total income from gum last year ago SD.-----**

**37. What are the main activities of the association?**

**38. Define the objectives of the associations?**

**39. Do you follow rotation in your farm ?**

Yes ( ) No ( ) why?

**40. If yes, describe the type and duration**

- 1- hashab with crops for ----- years
- 2- hashab only -----years
- 3- crops only -----years

**41. What are the benefits of hashab tree other than gum**

**42. Factors threatening hashab trees**

fires ( ), cash crops with quick revenue ( ), locust ( ),  
migration ( ), decrease of tapping skills ( ), others (specify)

**43. What is the age of your hashab trees ?**

18 years ( ), 20 years ( ), 22 years ( ), less than that ( ), more than ( )

**44. What are the uses of hashab trees when old?**

**45. Define the factors that affecting production of gum**

**46. Association management**

- who controls the association ?
- if it managed by committees, who select them
- is there any management defect you noticed?

Yes ( )specify No ( )

**47. your proposals to develop your association**

**48. How can you apply this proposals?**

### **APPENDIX III**

#### **Farmers Questionnaire**

##### **For Farmers in Areas without Associations**

**1. Introduction**

**2. General Information**

- Locality
- Rural Council
- Village
- Date of Intreview

**3. Social Characteristics for the Farmers within the Study area**

- Sex (a) Male (b) Female
- Age
- Education Level : illitrant, KHalwa, primary, sec., un.
- Occupation : farmer, merchant, teacher, others
- Marital Status: sigle, married, divorced, widow
- Family Size

- Total Area / Mukhamas
- Total Hashab Area
- Tapped all Area? Yes ( ), No ( )
- If No (why) ( tapping costive), no labor, low price, others (specify)

#### **4. Association Knowledges**

- Do you heard about the farmers' association in North Kordofan State?
- If yes, define the sources ?

#### **5. What do you know about the associations (details)**

#### **6. From your point of view, what are the benefits of associations?**

#### **7. Are you interested in establishing association in your village?**

#### **8. If yes, why?**

#### **9. Do you sugesst the steps you follow for establishing association?**

#### **10. What are the objectives you need to achieve from the association?**

#### **11. What do you propose to improve gum garden in your village?**